SEGREGATION AND RESEGREGATION IN NORTH CAROLINA'S PUBLIC SCHOOL CLASSROOMS*

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Although many studies have used information at the school level to measure the degree of racial segregation between schools, the absence of more detailed data has limited the analysis of segregation within schools. Using a rich set of administrative data on North Carolina public schools, we examine patterns of enrollment both across and within schools, allowing us to assess the comparative importance of segregation of each type and how they interact. To examine patterns in upper as well as lower grades, we perform separate tabulations for 1st, 4th, 7th, and 10th grades. The data make possible what we believe to be the most comprehensive study of within-school segregation undertaken in two decades, one that covers schools in all 117 districts of a large and racially diverse state. Using data for 1994/95 and 2000/01, we find marked increases in segregation over the period. In addition, we find that within-school segregation was much less important in the elementary grades than in 7th and 10th grades and that segregation of both types tended to be greatest in districts with nonwhite shares between 50 and 70%.

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INTRODUCTION

This Study presents evidence on patterns of and trends in interracial contact in public schools in North Carolina, focusing on the importance of racial disparities within schools as well as conventionally measured disparities between schools. Most previous social science research that has sought to measure school segregation has used data on the racial composition of schools and based measures of segregation on disparities between schools.[1] Consequently, this research can shed no light on any segregation that might exist within schools, that is, racial disparities across classrooms. In light of the ongoing debate in education policy concerning the

1. *See generally* JAMES S. COLEMAN, SARA D. KELLEY & JOHN A. MOORE, TRENDS IN SCHOOL SEGREGATION, 1968–73 (Urban Inst. Paper No. 722-03-01, 1975) (examining desegregation among districts and schools); GARY ORFIELD, PUBLIC SCHOOL DESEGREGATION IN THE UNITED STATES, 1968–1980 (1983) (examining desegregation among schools and determining the progress made since the 1960s); Charles T. Clotfelter, *Public School Segregation in Metropolitan Areas*, 75 LAND ECON. 487 (1999) (examining racial segregation among schools in metropolitan areas); Reynolds Farley, Toni Richards & Clarence Wurdock, *School Desegregation and White Flight: An Investigation of Competing Models and Their Discrepant Findings*, 53 SOC. EDUC. 123 (1980) (comparing statistical models of white flight); Reynolds Farley & Alma F. Taeuber, *Racial Segregation in the Public Schools*, 79 AM. J. SOC. 888 (1974) (presenting data on segregation among elementary schools during the 1967–68 school year); Steven G. Rivkin, *Residential Segregation and School Integration*, 67 SOC. EDUC. 279 (1994) (finding that residential segregation was the primary cause of school segregation).

desirability of tracking or other forms of heterogeneous grouping,[2] it is important to document such disparities within schools.

Employing detailed administrative data from North Carolina for the school years 1994/95 and 2000/01, we investigate the degree to which students of different racial and ethnic groups are in classrooms together. We examine these classroom patterns as part of a broader consideration of school segregation within the districts and counties in the state. Six main findings emerge. First, measured segregation differed significantly across the state, both between and within schools. Second, within-school segregation was relatively unimportant in elementary grades but represented a large share of total segregation in grades 7 and 10. Third, segregation of both types tended to be highest in districts whose shares of nonwhites were between 50 and 70%. Fourth, segregation in schools was less pronounced than residential segregation. Fifth, segregation between whites and Hispanics was less than that between whites and blacks in grades 1, 4, and 7, but it was higher in grade 10. Sixth, school segregation, both between and within schools, increased over the period 1994/95 and 2000/01 in each of the four grades we examine.

Section I of the Study discusses the importance of within-school segregation and briefly reviews some previous related research on school segregation. Section II describes patterns of racial segregation in North Carolina public schools using conventional measures based on disparities between schools. Section III describes the data and methods used to identify enrollment patterns at the classroom level, and Section IV employs these data to analyze segregation at the level of the classroom. Section V considers the relationship between racial composition and segregation, Section VI examines segregation within schools using a school-based measure, Section VII measures segregation on a metropolitan basis, and the conclusion follows.

I. PREVIOUS RESEARCH ON INTERRACIAL CONTACT AND SEGREGATION WITHIN SCHOOLS

From the earliest days of school desegregation, social scientists have documented the impact of policy by using descriptive measures of interracial contact and segregation. One common measure of interracial contact is the exposure rate, which gives the racial

2. *See generally* TOM LOVELESS, THE TRACKING WARS (1999) (discussing the ongoing debate on the desirability of tracking in schools); Jeannie Oakes, *Tracking in Secondary Schools: A Contextual Perspective*, 22 EDUC. PSYCHOLOGIST 129 (1987) (same).

composition of the school attended by the typical student of a given racial group. Another measure, reflecting racial isolation, gives the percentage of students of a given racial group who attend schools consisting predominantly of members of that same group. Measures of segregation, usually expressed in the form of indices bounded by 0 and 1, assess the degree of unevenness of racial compositions across constituent units such as schools. Among the indices that have been used in this way are the dissimilarity index and the gap-based segregation index used in the present Study.[3]

Most of this previous research on segregation in schools has focused on racial disparities between schools or between districts, with comparatively little attention being given to racial disparities in the makeup of classrooms *within* schools.[4] The principal reason for the relative lack of attention paid to segregation within schools is lack of data: although numerous detailed surveys have been conducted to measure the racial composition of schools, comparatively little information is available on enrollment patterns within classrooms. Yet segregation within schools—manifested in differences in racial composition across individual classrooms—is an issue of great potential importance.

Where it exists, such segregation obviously diminishes the potential for interracial contact inherent in school assignment plans designed to desegregate schools.[5] In some cases segregation within

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3. As summarized in equation (2), *infra* Part II, the gap-based segregation index is the percentage difference between the proportion of a district's students who are nonwhite and its exposure rate of whites to nonwhites, which is defined in equation (1). Among the many studies measuring segregation in schools are: COLEMAN, KELLEY & MOORE, *supra* note 1; ORFIELD, *supra* note 1; Clotfelter, *supra* note 1; Farley & Taeuber, *supra* note 1; Rivkin, *supra* note 1; Gary Orfield, Schools More Separate: Consequences of a Decade of Resegregation (July 2001) (unpublished manuscript, on file with the North Carolina Law Review), *available at* http://www.civilrightsproject.harvard.edu/research/deseg/Schools_More_Separate.pdf. The dissimilarity index measures the percentage of the students of one group that would have to move to a different school in order for all schools to be racially balanced. For a comparison of these and other measures of segregation, see David R. James & Karl E. Taeuber, *Measures of Segregation*, 15 SOC. METHODOLOGY 1 (1985).

4. For the purposes at hand, we follow the convention in the literature and use the term "race" to include classifications of race and ethnicity. The categories covered in the empirical work in this Study are those commonly used in research on education issues: Hispanic, non-Hispanic white, non-Hispanic black or African-American, Asian-American, Native-American, and other.

5. Presumably because such segregation within schools has been seen as a second line of defense against desegregation after outright resistance, it is sometimes referred to as "second generation discrimination." *See* Roslyn Arlin Mickelson, *Subverting* Swann: *First- and Second-Generation Segregation in the Charlotte-Mecklenburg Schools*, 38 AM. EDUC. RES. J. 215, 216 (2001) (using the term "second generation discrimination" in this manner).

schools has resulted from explicit, and sometimes blatant, practices. In the years immediately following legally mandated desegregation in the South, for example, some districts actually separated students by race using classroom partitions and segregated lunchrooms.[6] More recently, a federal court ruled in 1994 that school officials in Rockford, Illinois, had deliberately used a variety of policies to maintain racial segregation.[7] One device was a magnet program in which white students were assigned to predominantly minority schools but taught throughout the day in separate classrooms.[8] Another device was the use of pull-out programs for minority students, causing them to attend separate classes for much of the day.[9]

A less explicitly discriminatory policy that can also generate racially segregated classrooms within schools is academic tracking. Since tracking is based on the belief that teaching can be more effective when it is addressed to relatively homogeneous groups of students, assignments of students to tracks and, hence, classrooms should in theory be based on objective measures such as students' scores on aptitude tests. However, analyses of actual assignments to tracks in some districts have revealed racial bias. In the case of the Rockford district, for example, race as well as measured aptitude played a role in classroom assignments. Among students with similar scores on objective aptitude tests, whites were more likely to be assigned to honors classes than blacks.[10] Similar racial bias in the assignment to tracks in other districts has also been documented.[11]

To our knowledge, the most comprehensive attempt to measure the amount of racial contact of students within schools is Morgan and McPartland's examination of classroom assignments in 43,738 public

6. *See* KENNETH J. MEIER, JOSEPH STEWART, JR. & ROBERT E. ENGLAND, RACE, CLASS, AND EDUCATION: THE POLITICS OF SECOND-GENERATION DISCRIMINATION 49–50 (1989).

7. *See* People Who Care v. Rockford Bd. of Educ., 851 F. Supp. 905, 933 (N.D. Ill. 1994).

8. *Id.* at 916.

9. *Id.*

10. One consequence of Rockford's Gifted Program in one racially mixed school, for example, was to create "a school within a school" for white students. *Id.* at 916, 1012, 1026.

11. *See generally* Mickelson, *supra* note 5 (finding that tracking privileges educational opportunities along racial lines); Oakes, *supra* note 2, at 146–47 (discussing the impact of tracking on minority students); Jeannie Oakes & Gretchen Guiton, *Matchmaking: The Dynamics of High School Tracking Decisions*, 32 AM. EDUC. RES. J. 3 (1995) (same). For a more general discussion of tracking, see LOVELESS, *supra* note 2.

schools in the fall of 1976.[12] They found a small degree of intra-school segregation in elementary and middle school grades and a more pronounced degree in high schools.[13] Most of the studies of within-school segregation do not employ indices to measure such patterns at all. Gamoran[14] and Oakes and Guiton,[15] for example, examine the pattern of placements of students into academic tracks and present evidence that students of different racial groups faced different probabilities of being assigned to particular academic tracks, even after their measured achievement levels had been controlled for. Oakes[16] and Mickelson[17] analyze the effects of such placements on the racial composition of individual classes. In particular, Mickelson's study of high schools in Charlotte-Mecklenburg reveals a marked degree of segregation in some courses.[18] Her findings imply that within-school exposure rates were lower than corresponding school racial compositions, but her calculations do not make it possible to determine the precise contribution of within-school segregation to overall segregation.[19]

II. SEGREGATION IN NORTH CAROLINA: CONVENTIONAL MEASURES

Before examining segregation at the classroom level in North Carolina, we briefly note the policy context affecting the state's public schools, describe the racial composition of the state's public schools, and apply conventional measures of segregation to school-level data to characterize segregation across those schools. Like all other Southern states, North Carolina's public schools have operated under various forms of federal oversight since 1954, although at this writing

12. P.R. Morgan & James M. McPartland, The Extent of Classroom Segregation Within Desegregated Schools (August 1981) (unpublished manuscript, on file with the North Carolina Law Review).

13. *Id.* at 6.

14. *See* Adam Gamoran, *Access to Excellence: Assignment to Honors English Classes in the Transition from Middle to High School*, 14 EDUC. EVALUATION & POL'Y ANALYSIS 185, 201 (1992).

15. Oakes & Guiton, *supra* note 11, at 18.

16. Jeannie Oakes, Ability Grouping, Tracking, and Within-School Segregation in the San Jose Unified School District (Oct. 1993) (unpublished report, on file with the North Carolina Law Review).

17. Mickelson, *supra* note 5, at 233–34.

18. *See id.* at 239–43.

19. For a related analysis of various means of discrimination in schools, including disproportionate placement in special tracks, see MEIER, STEWART & ENGLAND, *supra* note 6, at 82–84. For an earlier study of interracial contact within a public middle school, see generally JANET WARD SCHOFIELD, BLACK AND WHITE IN SCHOOL: TRUST, TENSION, OR TOLERANCE? (1982).

the period of deliberate racial balancing exemplified by the *Swann* decision appears to be coming to an end.[20] And, like several other states in the South and elsewhere, it introduced a test-based accountability program in the early 1990s.[21] Such accountability programs attempt to improve the quality of public schools by providing additional incentives to administrators, teachers, and students in the form of rewards for gains in measured performance.[22] In 1997, North Carolina adopted a formal school-based accountability system featuring widespread student testing, monetary rewards for successful schools, and greater scrutiny of unsuccessful ones.[23] Moreover, a case in which plaintiffs challenged the adequacy of the state's system of financing schools has drawn new attention to the resources available for "at-risk" students.[24]

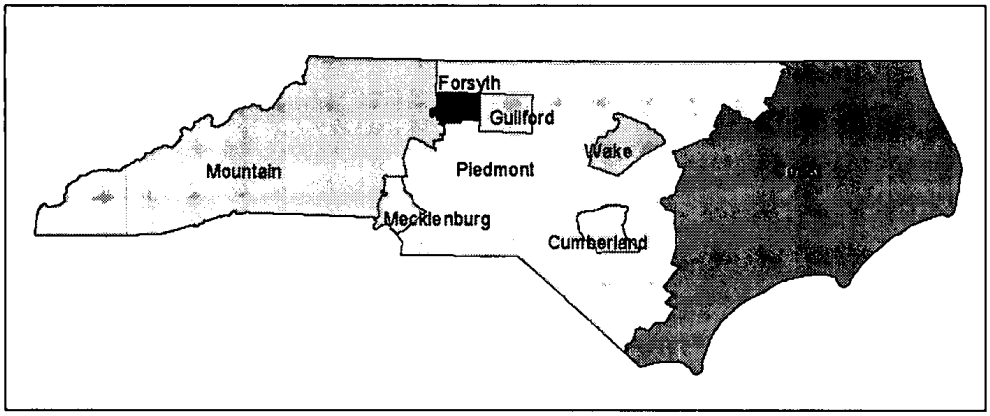

Figure 1. North Carolina School Districts, 2000/2001.

North Carolina, the nation's eleventh most populous state, has a sizable minority population, and it features many urban as well as rural school districts.[25] Although the state has a small but rapidly growing Hispanic population, African Americans remain the largest

20. *See* John Charles Boger, *Willful Colorblindness: The New Racial Piety and the Resegregation of Public Schools*, 78 N.C. L. REV. 1719, 1732–40 (2000).

21. *See generally* HOLDING SCHOOLS ACCOUNTABLE: PERFORMANCE-BASED REFORM IN EDUCATION (Helen F. Ladd ed., 1996) (discussing the objectives of test-based accountability programs).

22. *Id.* at 23–98.

23. *See* Helen F. Ladd & Arnaldo Zelli, *School-Based Accountability in North Carolina: The Responses of School Principals*, 38 EDUC. ADMIN. Q. 494, 498–500 (2002).

24. *See* Leandro v. State, 346 N.C. 336, 342, 488 S.E.2d 249, 252 (1997); Hoke County Bd. of Educ. & Asheville City Bd. of Educ. v. State, No. 95 CVS 1158, 2000 WL 1639686, at *1 (N.C. Super. Ct. Oct. 12, 2000).

25. U.S. BUREAU OF THE CENSUS, STATISTICAL ABSTRACT OF THE UNITED STATES 2001, 21 tbl.18; *infra* Appendix A of the present Study.

minority group by far.[26] Counting students in charter schools, the state enrolled some 1.3 million students in grades K–12 in 2000/01.[27] As a way of reflecting broad patterns in the state without undue complexity, we divided the state's 117 public school districts into eleven groups—the five largest districts, other urban districts in the state's three regions, and rural districts in the three regions (those regions being the Coastal Plain in the east, the Mountains in the west, and the Piedmont in the middle).[28] These divisions are shown on the state map in Figure 1, and the corresponding enrollments and racial compositions are shown in Table 1.

Table 1. Enrollment and Racial Composition in North Carolina Public Schools, 2000/01, State and District Groups.

		Percentage of students				Growth rate,
	Total enrollment[a]	Black	Hispanic	Other nonwhite	All nonwhite	1994/95–2000/01
State of NC	1,281,201	31.1	4.4	3.3	38.9	1.9
Five largest districts						
Charlotte-Mecklenburg	104,260	43.1	5.5	4.9	53.4	3.4
Wake	98,975	27.7	4.6	4.2	36.4	4.2
Guilford	63,585	41.9	3.3	4.4	49.6	2.3
Cumberland	50,927	48.4	5.3	3.3	57.1	0.4
Winston-Salem/Forsyth	45,914	39.0	6.5	1.3	46.8	2.6
Other urban						
Coastal	133,246	42.4	3.3	1.3	47.0	0.5
Piedmont	128,288	37.6	6.1	2.5	46.2	2.2
Mountain	96,980	17.5	3.2	2.9	23.7	1.1
Rural						
Coastal	79,269	37.5	3.6	0.6	41.6	0.5
Piedmont	299,922	30.3	4.6	5.4	40.2	1.9
Mountain	179,835	8.5	3.6	2.2	14.3	1.7

Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; Membership Data, 1994/95 and 2000/01 and North Carolina Public Schools Statistical Profile 2001; authors' calculations.
(a) Includes charter schools.

26. U.S. BUREAU OF THE CENSUS, *supra* note 25, at 26 tbl.24. Between 1992 and 2000 the state's Hispanic population grew from 84,000 to 379,000, for an annual rate of 18.8%, compared to 4.7% a year for the nation (24.3 to 35.3 million). Calculated from the *Statistical Abstract of the United States 1996*, 34 tbl.35, and *Statistical Abstract of the United States 2001*, 25 tbl.23. These are exponential growth rates.

27. Charter schools were included with the districts in which each was located, although they were administratively independent of those districts. *See* Table 1.

28. We classified as urban all districts in counties that were 45% or more urban in 1990 and all city districts in any county with enrollments of at least 2,000 in 2001/02, not counting charter school enrollments. The boundaries between Coastal, Piedmont, and Mountain counties were taken from CAROLINA STATE PARKS & RECREATION AREAS, YOURS TO DISCOVER (1998).

All five of the largest districts are county-wide, as are a majority of all districts in the state.[29] Charlotte-Mecklenburg, which includes the city of Charlotte, is the largest district in the state, with 104,000 students in 2000/01, 53% of whom were nonwhite, as indicated in Table 1. Wake County, which includes the state capital of Raleigh, had 99,000 students, 36% of whom were nonwhite. The other three districts (and their major cities) are Guilford (Greensboro and High Point), Cumberland (Fayetteville), and Winston-Salem/Forsyth (hereafter referred to as Forsyth). Together, these five urban districts accounted for 33% of the state's public school students in 2000/01, roughly the same number as were contained in the state's remaining thirty-two urban districts. In racial composition, the Coastal Plain and Piedmont had roughly twice the proportion of nonwhite students as the Mountain region, as indicated by the map in Figure 2. Reflecting the state's moderately rapid overall growth rate, enrollments grew at an annual rate of 1.9% between 1994/95 and 2000/01, paced by growth rates over 3% in the state's two largest districts, Charlotte-Mecklenburg and Wake County.[30]

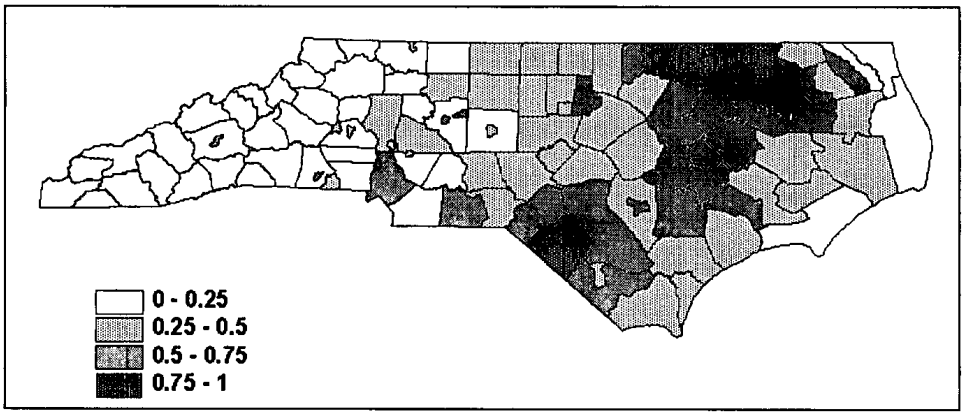

Figure 2. Percent Nonwhite in North Carolina School Districts, 1990/00.

To summarize the extent of segregation in the schools, we employ an index based on the exposure rate, which is defined here as the percentage of nonwhite students enrolled with the typical white student. As conventionally calculated, based on school-level data, this exposure rate in district k is

29. Of the 117 districts, 88 were county-wide. *See infra* Appendix A, Table A1. Five counties contained three districts each, and seven more contained two. *Id.*

30. A listing of all of the state's 117 school districts in 2000/01 appears in Appendix A, *infra*, along with district group designation and information on enrollment, racial composition, and segregation.

$$E_k^* = [\Sigma\, W_j\ \%NW_j\,] / \Sigma\, W_j, \qquad (1)$$

where W_j is the number of whites in school j and $\%NW_j$ is its nonwhite percentage. This exposure rate is simply a weighted average of the racial compositions of schools, where the shares of white enrollments are used as the weights. If all schools in a district were racially balanced, the exposure rate would reach its maximum value, which is equal to the nonwhite percentage in the district. At the other extreme, if whites and nonwhites attended entirely separate schools, the exposure rate would be zero, indicating that the average white student attended a school with no nonwhites. The segregation index we use is defined as the percentage gap between the maximum exposure rate, which is the nonwhite percentage, and the actual exposure rate of whites to nonwhites, based on classroom-level data. This index thus measures the degree to which the actual distribution of students diverges from a racially balanced distribution. For district k, this gap-based segregation index is calculated as

$$S_k^B = (\%NW_k - E_k^*) / \%NW_k. \qquad (2)$$

For a district in which all schools reflect the overall racial composition of students, S_k^B takes on its minimum value of zero. By contrast, when schools are completely segregated, so that $E_k^* = 0$, the index takes on its maximum value of one.

A second, closely related concept is that of racial isolation, reflected by measures such as the percentage of nonwhites who are in schools with 90–100% nonwhite enrollment. Higher values indicate more racial isolation. In contrast to a measure of segregation such as S_k^B that implicitly corrects for the racial composition of the district, these measures of racial isolation are necessarily functions of the racial composition of the district. We employ this segregation index as our basic measure of segregation for three reasons. First, like the dissimilarity index, it has been and is used in numerous studies[31] and therefore is familiar to many scholars and policy makers. Second, also like the dissimilarity index, it is a relative measure that corrects for a district's overall racial composition, and so its value is not influenced by that overall racial composition. This is in contrast to the measure of racial isolation described below, which we employ only because it is easily understood. The third reason we employ the gap-based segregation index is that, unlike the dissimilarity index, it is

31. *See, e.g.*, COLEMAN, KELLEY & MOORE, *supra* note 1, at 7–8 & n.4 (examining desegregation among districts and schools); Clotfelter, *supra* note 1, at 490–91 (examining racial segregation among metropolitan schools); Morgan & McPartland, *supra* note 12, at 3–5 (examining intra-school segregation).

easily decomposed into meaningful parts; this decomposition is central to our Study.

Table 2. Segregation in School Districts in North Carolina, 1994/95 and 2000/01, Using Two Measures Based on School-Level Data.

	Gap-based segregation index S_k^B		Percentage of nonwhite students in schools 90–100% nonwhite	
	1994/95	2000/01	1994/95	2000/01
State of NC	0.10	0.13	4.4	6.7
Five largest districts				
Charlotte-Mecklenburg	0.12	0.20	2.2	6.9
Wake	0.06	0.09	0.0	0.9
Guilford	0.24	0.29	11.8	18.0
Cumberland	0.11	0.13	3.5	2.8
Winston-Salem/Forsyth	0.07	0.25	0.0	20.0
Other urban				
Coastal	0.11	0.14	3.0	11.8
Piedmont	0.11	0.11	11.5	7.8
Mountain	0.07	0.08	0.0	0.3
Rural				
Coastal	0.06	0.07	1.3	2.1
Piedmont	0.11	0.12	8.2	9.0
Mountain	0.06	0.08	0.0	0.2

Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; Membership Data, 1994/95 and 2000/01 and North Carolina Public Schools Statistical Profile 2001; authors' calculations.
Note: Charter schools included. Figures shown are weighted averages of district statistics, where weights are district enrollments.

Table 2 presents calculations using the segregation index S_k^B and the percentage of nonwhite students who attended schools that were 90–100% nonwhite. Data on each school's enrollment in the 1994/95 and 2000/01 years were used to make the calculations, and weighted averages of the resulting segregation indices are given for the state and the eleven district groups described above. Note that the measures shown in Table 2 are based on conventional school-level data. For the state as a whole, both of the indices were generally quite low in both years, suggesting that the state's public school districts were able to achieve a fairly high degree of racial balance across schools. By way of comparison, the average segregation index of 0.13 for districts in the state in 2000/01 is greater than eleven of the fifteen districts comprising the Washington metropolitan area in 1994/95, using the same index of segregation. Districts with indices in 1994/95 close to the North Carolina average for 2000/01 were: Frederick Co., Maryland (0.10), Fairfax Co., Virginia (0.12), and Montgomery Co., Maryland (0.14).[32] However, the indices calculated

32. Clotfelter, *supra* note 1, at 492 tbl.1.

for the five largest districts indicate considerable variation in the degree of measured segregation within individual districts. In 2000/01, segregation in Guilford (0.29) and Forsyth (0.25) were the highest among the state's largest districts. By comparison, these indices were less than Washington, D.C., in 1994/95 (0.48) but greater than the 0.23 registered in both Prince George's County and Arlington County. The second segregation measure, the percentage of nonwhites in schools that were 90–100% nonwhite, also indicates little of the extreme concentration of minority enrollments that was both a hallmark of de jure segregation and is a characteristic of many contemporary urban areas.[33] For the 2000/01 year, therefore, these two segregation measures based on school-level data indicate that public schools in North Carolina were, on average, not highly segregated in comparison to other districts in the United States, although some districts certainly stand out as having markedly more pronounced segregation.

Despite these generally low levels of segregation, a comparison of measures for 1994/95 and 2000/01 in Table 2 shows a widespread trend toward increasing segregation in the state, again based on school-level measures. For the state the average segregation index and the percentage of nonwhites in largely nonwhite schools each increased by about a third. The segregation index increased in all but one of the district groups, rising markedly in Forsyth and Charlotte-Mecklenburg. Among the districts and district groups, Forsyth stands out. In that district, the percentage of nonwhites in 90–100% minority schools jumped from zero to 20%. Smaller increases were evident in Guilford and other urban Coastal districts. In Section VII of the Study we examine trends in segregation as measured on a metropolitan area basis.

An interesting footnote to this rising segregation is the role played by charter schools. Authorized in 1996,[34] charter schools began operating in North Carolina in 1997. Although they constituted only 1.2% of the state's overall enrollment in 2000/01,[35]

33. *See infra* Appendix C, Table A3. *See generally* U.S. COMMISSION ON CIVIL RIGHTS, RACIAL ISOLATION IN THE PUBLIC SCHOOLS 12 (1967) (giving similar measures for a number of urban school districts in the 1950s and 1960s). *See also* Clotfelter, *supra* note 1, at 494 tbl.3 (giving similar measures for large metropolitan areas in 1994/95). Few of the districts in either of these tables have measures as low as 6.7%—the state average in North Carolina in 2000/01. *See supra* Table 2.

34. *See* Charter Schools Act of 1996, ch. 731, § 2, 1995 N.C. Sess. Laws 424, 424–25 (codified at N.C. GEN. STAT. § 115C-238.29A (2001)).

35. North Carolina Charter Schools, Brief Background and History of Charter Education in North Carolina, *at* http://www.ncpublicschools.org/charter_schools/

charter schools were responsible for part of the rise in segregation over the period. If charter schools had been omitted from the calculations of segregation in 2000/01, the average value of S_k^B for the state would have been 0.12 rather than 0.13, and the percentage of nonwhites in 90–100% nonwhite schools would have been 6.1 rather than 6.7.[36] These comparisons suggest that the growth in charter school enrollments was responsible for more than a quarter of the increase in overall school segregation over the period. Charter schools had this effect because they enrolled a disproportionate number of black students and included a large number of predominantly black schools.[37] This outcome has created a dilemma for North Carolina policy makers, who, fearing initially that charter schools might become havens for white students, required that charter schools be nondiscriminatory and "reasonably reflect" the racial composition of the local public school district.[38]

III. EXAMINING ENROLLMENT PATTERNS WITHIN SCHOOLS: DATA AND METHODOLOGY

Examining racial patterns across classrooms within schools is complicated by the fact that students at all grade levels ordinarily have instruction in more than one class over the course of a day or week, ranging from pull-out reading instruction and music in elementary schools to the dozens of classrooms among which high school students scurry each hour when the bell rings. Since we were most interested in interracial contact during academic instruction time, we chose to focus on the classes that most nearly approximated the basic academic instruction at each grade level.

To examine these classroom assignments, we were fortunate to have access to detailed unpublished administrative data from the North Carolina Department of Public Instruction, made available to us under strict conditions to insure confidentiality of information on

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background.html (last visited Dec. 30, 2002) (on file with the North Carolina Law Review) [hereinafter North Carolina Charter Schools]. Total charter school enrollment in 2000/01 was 15,500, compared to 1,281,201 in conventional public schools. *See infra* Appendix A.

36. To be valid, such a conclusion assumes that, in the absence of charter schools, the students who would have attended them would have been distributed among public schools by racial composition in the same proportions as were actual public school students in 2000/01.

37. In 2000/01, 43% of charter school students were black, compared to 31% in conventional public schools. North Carolina Charter Schools, *supra* note 35. The higher prevalence of predominantly black schools is implied by the increased percentage of nonwhites in 90%–100% of nonwhite schools noted in the text.

38. *See* N.C. GEN. STAT. § 115C-238.29f(g)(5) (2001).

individual students and teachers. For each school in the state, the department collected information on the racial composition of each "activity" throughout the school week, with figures broken down further by grade level. To reflect interracial contact at different grade levels while keeping the tasks of calculations and presentation manageable, we performed calculations at the 1st, 4th, 7th, and 10th grades. To avoid the complications introduced by pull-out programs and multiple classes or courses, we adopted a strategy of placing every student in each of our four grade levels into exactly one classroom. We intended this classroom to be the primary instructional class for students in grades 1 and 4, and the students' English class in grades 7 and 10.

In elementary schools, activities included subjects taught by a special teacher or instruction outside of the regular classroom, such as physical education or music, as well as academic subjects taught by a regular teacher, such as math or language arts. Reflecting the practice of assigning a single teacher to lead instruction in most academic subjects for the same group of children, the most common activity definition in elementary grades was "self-contained."[39] For the 1st and 4th grades in most schools, therefore, we could use this "self-contained" activity to indicate classroom assignment. In implementing this approach, however, we found that the classification of activities offered in schools appeared not to be uniform across the state, reflecting either inconsistency in applying activity definitions or actual variation in the way districts organized instruction in their schools. For example, while the data indicated that most elementary schools offered self-contained classes, the category was missing altogether for some schools.

To account for differences across schools, we allowed the particular combination of activities used to differ across schools, and chose that combination whose total enrollment in the grade of interest came closest to the actual number of students enrolled in that

39. "Self-contained" is a category used by the North Carolina Department of Public Instruction in the Student Activity Reports that are based on surveys of school districts. *See* N.C. DEP'T OF PUB. INSTRUCTION, SCHOOL ACTIVITY REPORT, PROFESSIONAL PERSONNEL ACTIVITY REPORT GUIDELINES 19 (1999), *available at* http://ncwise.org/documents/sims/sarguidelines.pdf (last visited Dec. 30, 2002) (on file with the North Carolina Law Review); *see also infra* Appendix C, Table A2 (illustrating the prevalence of the self-contained category). This category also appears in the unpublished electronic data used for this Study.

grade in the school.[40] For 1st graders, self-contained was the activity that yielded the best fit to total 1st grade enrollment in 83% of the state's schools. In the remaining schools, another subject, such as general music, visual arts, or physical education provided the best fit. In using these other subjects, we are assuming that students who are grouped together for, say, general music, are also grouped together for the bulk of their academic subjects. For 4th graders, the self-contained designation yielded the best fit for 73% of the elementary schools, with general music, reading, math, and language arts combining to give the best fit in another 13% of schools.

In middle schools and high schools, the activities designated on the school reports generally corresponded to classes. For a particular high school, for example, information was available on the number of students, by race, in each section of Algebra I taught in the school, and within each of those sections the racial breakdown of 10th grade students and, if students from other grades were enrolled in the class, the racial breakdown of the students from each of those grade levels as well. Similar information was provided for all courses. We focused on classes in English, or language arts. Some high schools offered only four levels of English (denoted by levels I–IV), while others offered those four plus English as a second language, occupational English, or courses combining language arts with other subjects. However, since every student in theory was required to take one of them every year, we counted 7th or 10th grade students in whatever English course they were enrolled. Among schools containing a 7th grade, the best fit was attained in 42% of schools by counting all English courses, including reading courses and courses combining language arts with other subjects; but in another 27% of schools the best fit meant excluding reading and combined courses. For high schools, the best grouping at the 10th grade level was to combine all English-related courses, a combination that worked best in 83% of schools.[41]

Once each student in each of the four grade levels was assigned to a classroom, exposure rates could be calculated by extending the logic of the conventional measure described above in equation (1). Instead of measuring the nonwhite percentage in the typical white student's school, our more exact measure of exposure gives the

40. Enrollment based on student activity reports might not exactly match enrollment figures from so-called membership reports, which simply report enrollment totals, because these two surveys were undertaken on different dates in the fall.

41. *See infra* Appendix C (providing a more detailed description of the methodology).

nonwhite percentage in the typical white student's *classroom*.[42] We performed these calculations for classes that contained any students in grades 1, 4, 7, or 10. Unless the classrooms in each school are racially balanced at that school's racial composition, this exposure rate will be lower than the school-level exposure rate, and this difference can be attributed entirely to segregation within the school. By virtue of the additional level of detail provided by classroom-level data, therefore, segregation in a district can be decomposed into two components: (1) the portion due to racial disparities at the classroom level, within schools; and (2) the portion due to racial disparities between schools, within a district. This second portion is equivalent to S_k^B, the segregation index based on school-level data. Since this conventional segregation index is based on school-level data, it systematically understates actual segregation. Just how serious this understatement is will depend on the relative magnitude of the within-school component.[43] In summary, we decompose a district's segregation into two pieces: that which is attributable to between-school segregation in the district and that which is attributable to within-school segregation in the district. As defined up to this point, these measures have been based on disparities in enrollment patterns defined in terms of white and nonwhite students, but they can easily be modified to assess segregation between any two racial groups.

IV. SEGREGATION USING CLASSROOM-LEVEL DATA

Table 3 presents segregation indices using classroom-level data calculated for districts in the state for both school years, at each of four grade levels. The first panel employs the basic white/nonwhite division used throughout the Study. By comparing this first section to Table 2, it becomes immediately evident that these indices are larger than those based on school-level data, suggesting that segregation within schools does exist and that segregation measures based on school-level data consequently understate total segregation. Interestingly, the relative ranking of these indices across districts is quite similar to that based on the school-level data in Table 2. To illustrate this similarity for 2000/01: the most segregated of the largest districts (Guilford) also had the highest segregation index for three of the four grade levels shown; the three urban district groups have the

42. *See infra* Appendix B, equation B-1 (showing the exact formula).

43. By similar logic, it is possible to decompose segregation within a county into a third part, that due to disparities between districts, in a way parallel to the approach we use for metropolitan areas, as detailed in *infra* Appendix B. Because the vast majority of counties had only one district, we do not use this decomposition.

same rank in grades 1, 4, and 7 in Table 3 as they do for the school-level indices in Table 2; and, among rural districts, those in the Piedmont were most segregated in Table 2 and in each grade level in Table 3. A second notable aspect of these indices is the differences that are evident among grade levels. Measured segregation was somewhat higher in grades 7 and 10 than for the two elementary grades; for 2000/01 the average index was 0.23 for the higher two grades and 0.20 for the lower two.

Table 3. Segregation in Grades 1, 4, 7, and 10 in North Carolina Districts, 1994/95 and 2000/01, Using Classroom-Level Data, Four Alternative Racial Divisions.

1) Nonwhite and White (Basic Measure)

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
State of NC	0.15	0.20	0.14	0.20	0.18	0.23	0.20	0.23
Five largest districts								
Charlotte-Mecklenburg	0.19	0.28	0.18	0.27	0.28	0.34	0.26	0.31
Wake	0.09	0.14	0.08	0.15	0.20	0.27	0.21	0.24
Guilford	0.27	0.37	0.28	0.36	0.37	0.38	0.39	0.37
Cumberland	0.15	0.18	0.14	0.20	0.18	0.20	0.14	0.17
Winston-Salem/Forsyth	0.12	0.36	0.13	0.38	0.16	0.38	0.19	0.26
Other urban								
Coastal	0.17	0.22	0.13	0.23	0.18	0.27	0.22	0.24
Piedmont	0.16	0.18	0.17	0.19	0.17	0.23	0.23	0.25
Mountain	0.12	0.17	0.13	0.14	0.10	0.15	0.14	0.18
Rural								
Coastal	0.10	0.15	0.10	0.14	0.14	0.19	0.15	0.16
Piedmont	0.16	0.20	0.16	0.19	0.18	0.21	0.18	0.21
Mountain	0.12	0.15	0.11	0.12	0.14	0.15	0.15	0.21

2) Black and White Only

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
State of NC	0.16	0.23	0.15	0.22	0.18	0.24	0.20	0.23
Five largest Districts								
Charlotte-Mecklenburg	0.20	0.28	0.18	0.28	0.28	0.37	0.28	0.33
Wake	0.10	0.18	0.09	0.20	0.22	0.33	0.22	0.28
Guilford	0.27	0.41	0.29	0.40	0.37	0.41	0.41	0.40
Cumberland	0.16	0.22	0.15	0.23	0.20	0.23	0.16	0.19
Winston-Salem/Forsyth	0.12	0.42	0.13	0.44	0.16	0.42	0.20	0.27
Other urban								
Coastal	0.18	0.26	0.14	0.26	0.18	0.29	0.23	0.26
Piedmont	0.18	0.21	0.18	0.21	0.18	0.24	0.23	0.23
Mountain	0.13	0.19	0.12	0.17	0.10	0.15	0.15	0.15
Rural								
Coastal	0.11	0.16	0.10	0.15	0.14	0.19	0.15	0.15
Piedmont	0.16	0.21	0.16	0.20	0.17	0.21	0.18	0.20
Mountain	0.12	0.17	0.12	0.13	0.13	0.14	0.12	0.14

3) Hispanic and White Only

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
State of NC	0.11	0.20	0.09	0.16	0.16	0.25	0.17	0.34
Five largest districts								
Charlotte-Mecklenburg	0.18	0.46	0.16	0.34	0.29	0.44	0.15	0.34
Wake	0.10	0.16	0.07	0.13	0.09	0.26	0.25	0.31
Guilford	0.16	0.38	0.13	0.31	0.25	0.40	0.18	0.42
Cumberland	0.11	0.14	0.13	0.17	0.16	0.19	0.15	0.20
Winston-Salem/Forsyth	0.18	0.38	0.13	0.29	0.39	0.41	0.11	0.37
Other urban								
Coastal	0.09	0.18	0.09	0.15	0.10	0.23	0.16	0.27
Piedmont	0.13	0.18	0.12	0.19	0.22	0.31	0.19	0.50
Mountain	0.08	0.14	0.07	0.09	0.07	0.18	0.10	0.31
Rural								
Coastal	0.11	0.17	0.08	0.13	0.12	0.20	0.11	0.31
Piedmont	0.11	0.21	0.10	0.17	0.16	0.27	0.17	0.34
Mountain	0.07	0.11	0.06	0.09	0.12	0.17	0.20	0.33

4) Black and Hispanic Only

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
State of NC	0.18	0.23	0.17	0.20	0.25	0.30	0.22	0.34
Five largest districts								
Charlotte-Mecklenburg	0.15	0.32	0.19	0.16	0.32	0.34	0.17	0.29
Wake	0.21	0.24	0.16	0.21	0.22	0.29	0.33	0.37
Guilford	0.20	0.25	0.17	0.17	0.30	0.30	0.24	0.40
Cumberland	0.12	0.11	0.09	0.13	0.12	0.15	0.12	0.13
Winston-Salem/Forsyth	0.18	0.24	0.15	0.20	0.47	0.32	0.17	0.33
Other urban								
Coastal	0.15	0.22	0.14	0.20	0.15	0.31	0.21	0.27
Piedmont	0.19	0.16	0.16	0.19	0.29	0.28	0.21	0.51
Mountain	0.23	0.27	0.19	0.27	0.29	0.30	0.27	0.50
Rural								
Coastal	0.13	0.23	0.10	0.17	0.14	0.21	0.18	0.26
Piedmont	0.20	0.23	0.18	0.19	0.22	0.32	0.22	0.32
Mountain	0.38	0.40	0.46	0.43	0.51	0.46	0.48	0.58

Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; School Activity Report Data, 1994/95 and 2000/01; authors' calculations.

As in the previous table based on conventional school-level measures, Table 3 indicates that rates of segregation calculated from classroom-level data generally increased over the six-year period. The average index for the state rose from 0.15 to 0.20 in the 1st grade, from 0.14 to 0.20 in the 4th grade, from 0.18 to 0.23 in the 7th, and from 0.20 to 0.23 in the 10th. It is striking that segregation increased at every grade level and in every district and district group shown.

Given the history of slavery and Jim Crow segregation in the South and the history of discrimination against blacks in the United States, it is pertinent to ask whether patterns of segregation concerning black students are in any way distinctive from that of

other minorities. And, given the growing importance of Hispanics in the country, as well as their recent growth in North Carolina,[44] examining segregation as it applies to Hispanic students is also important. Thus the remaining three sections of Table 3 present comparable average segregation indices for the state based on black/white, Hispanic/white, and black/Hispanic groupings of students. Significantly, for all but the 10th grade, whites tended to be more segregated from blacks than from nonwhites in general, a generalization that applies to almost every district or regional group. For Hispanic/white segregation, the differences are less consistent. Compared to blacks, Hispanic students were generally less segregated from whites at the 1st and 4th grades in both years. But in the 7th and 10th grades Hispanic/white segregation intensified markedly over the period, becoming by 2000/01 more pronounced than black/white segregation. The increase in the average white-Hispanic index over this period was more than twice that of any other racial pair.[45] The last line of Table 3 shows that Hispanic and black students also tended to be segregated from each other as much or more than whites were from Hispanics.

Table 4. Segregation Between and Within Schools in North Carolina Districts, Grades 1, 4, 7, and 10, 1994/95 and 2000/01.

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
State of NC								
Total	0.15	0.20	0.14	0.20	0.18	0.23	0.20	0.23
Between schools	0.13	0.17	0.12	0.16	0.09	0.11	0.08	0.09
Within schools	0.02	0.04	0.02	0.04	0.09	0.12	0.12	0.15
Five largest districts								
Charlotte-Mecklenburg								
Total	0.19	0.28	0.18	0.27	0.28	0.34	0.26	0.31
Between schools	0.17	0.25	0.14	0.24	0.12	0.19	0.10	0.13
Within schools	0.03	0.03	0.03	0.03	0.16	0.15	0.16	0.17
Wake								
Total	0.09	0.14	0.08	0.15	0.20	0.27	0.21	0.24
Between schools	0.08	0.11	0.06	0.10	0.06	0.07	0.05	0.07
Within schools	0.02	0.03	0.02	0.05	0.14	0.20	0.16	0.17

44. North Carolina's Hispanic population grew at a rate of over 18% a year from 1992 to 2000. *See supra* note 26. By 2000 Hispanics comprised almost 5% of the total population. U.S. BUREAU OF THE CENSUS, *supra* note 25, at 25 tbl.23.

45. Percentage increases in the unweighted average of segregation indices were: white-nonwhite, 28%; black-white, 33%; Hispanic-white, 79%; and Hispanic-black, 30%. *See supra* Table 3. For example, the unweighted average of white-nonwhite segregation was 0.1675 (averaging 0.15, 0.14, 0.18, and 0.20) in 1994/95 and 0.215 (the average of 0.20, 0.20, 0.23, and 0.23) in 2000/01. The percentage increase from 0.1675 to 0.215 was 28%. *See id.*

Guilford								
Total	0.27	0.37	0.28	0.36	0.37	0.38	0.39	0.37
Between schools	0.25	0.34	0.26	0.32	0.23	0.26	0.28	0.26
Within schools	0.01	0.03	0.02	0.04	0.14	0.12	0.11	0.11
Cumberland								
Total	0.15	0.18	0.14	0.20	0.18	0.20	0.14	0.17
Between schools	0.13	0.14	0.12	0.16	0.11	0.13	0.08	0.10
Within schools	0.02	0.04	0.02	0.04	0.07	0.07	0.07	0.07
Winston-Salem/Forsyth								
Total	0.12	0.36	0.13	0.38	0.16	0.38	0.19	0.26
Between schools	0.11	0.34	0.10	0.32	0.02	0.24	0.04	0.11
Within schools	0.01	0.02	0.03	0.06	0.14	0.14	0.15	0.15
Other urban								
Coastal								
Total	0.17	0.22	0.13	0.23	0.18	0.27	0.22	0.24
Between schools	0.15	0.18	0.11	0.18	0.10	0.14	0.08	0.10
Within schools	0.02	0.04	0.02	0.05	0.07	0.13	0.13	0.14
Piedmont								
Total	0.16	0.18	0.17	0.19	0.17	0.23	0.23	0.25
Between schools	0.14	0.15	0.14	0.15	0.08	0.07	0.09	0.06
Within schools	0.02	0.03	0.02	0.04	0.09	0.16	0.14	0.19
Mountain								
Total	0.12	0.17	0.13	0.14	0.10	0.15	0.14	0.18
Between schools	0.10	0.13	0.10	0.12	0.03	0.05	0.04	0.04
Within schools	0.02	0.04	0.03	0.03	0.07	0.10	0.10	0.14
Rural								
Coastal								
Total	0.10	0.15	0.10	0.14	0.14	0.19	0.15	0.16
Between schools	0.07	0.11	0.08	0.09	0.05	0.08	0.04	0.05
Within schools	0.03	0.05	0.02	0.05	0.09	0.11	0.11	0.12
Piedmont								
Total	0.16	0.20	0.16	0.19	0.18	0.21	0.18	0.21
Between schools	0.14	0.16	0.13	0.15	0.11	0.11	0.09	0.08
Within schools	0.02	0.04	0.03	0.04	0.07	0.10	0.10	0.13
Mountain								
Total	0.12	0.15	0.11	0.12	0.14	0.15	0.15	0.21
Between schools	0.09	0.11	0.09	0.09	0.06	0.06	0.04	0.05
Within schools	0.03	0.04	0.02	0.03	0.08	0.09	0.11	0.17

Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; School Activity Report Data, 1994/95 and 2000/01; authors' calculations.
Note: Total segregation is S_k, between-school segregation is S_k^B, and within-school segregation is S_k^W. *See infra* Appendix B.

To assess the importance of segregation within schools, Table 4 presents weighted averages for North Carolina showing the two components of segregation. The calculations show, first of all, that the contribution of within-school segregation differs markedly by grade level. Classroom-level segregation was practically nonexistent in grades 1 and 4 in North Carolina in 2000/01, indicated by indices of 0.04.[46] In grades 7 and 10, however, racial disparities between

46. A simulated random assignment of students to schools and classrooms within districts was performed using computer-generated random numbers to place students into

classrooms in the same school were a more important source of segregation than differences between schools. Whereas within-school segregation accounted for only about a fifth of total segregation in grade 1, it was well over half of the total in grade 10. This pattern probably reflects high schools' larger sizes and greater differentiation among classes, as compared to elementary schools. It also reflects the likelihood that, owing to their smaller size, elementary schools are more likely than high schools to reflect segregated residential patterns, in the absence of busing.

The remainder of Table 4 presents the same decomposition of segregation at the four grade levels for the five largest districts and the additional six district groups. Regarding patterns in 2000/01, between-school segregation was generally higher in the elementary schools than in the high schools. This makes sense, given the wider geographic coverage of high schools. Because residential areas tend to be segregated by race, the racial composition of larger geographic areas will tend to be closer to a district's overall racial composition. The reverse relationship tended to characterize within-school segregation, with high schools showing the highest rates. In fact, at the two elementary grades throughout the state, within-school segregation was virtually nonexistent. In terms of variation across the state, between-school segregation was especially low in the rural districts in the Coastal and Mountain regions, which corresponds to the school measures shown in Table 2. By contrast, between-school segregation was comparatively high in Guilford, Forsyth, and, to a lesser extent, in Mecklenburg. As for within-school segregation, it appeared to be a significant factor only in grades 7 and 10, and then only in some districts. In 2000/01, it reached its highest values in Wake's 7th grades and in the urban Piedmont's 10th grades. Remarkable for its low measured within-school segregation is Cumberland County, with consistent indices of 0.07 in both 7th and 10th grades.

Table 4 also reveals that segregation increased over the six-year period 1994/95 to 2000/01. For the state, total segregation increased

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classrooms. These simulations yielded school racial compositions that were generally very close to racial balance, but in some schools yielded distributions that deviated noticeably from racial balance. For the state as a whole, our simulation suggests that random distribution of students in 2000/01 would have produced within-school segregation indices of 0.04 in grades 1 and 4, 0.05 in grade 7, and 0.06 in grade 10. By contrast, random assignment would have produced between-school indices of 0.01 in grades 1 and 4 and 0.00 in grades 7 and 10. If random assignment rather than racial balance were adopted as the benchmark for measuring segregation, therefore, the within-school portion would be smaller than what is implied in the present Study.

by 0.06 in grade 4, 0.05 in grades 1 and 7, and 0.03 in grade 10. For the state, between-school segregation increased most in the elementary grades, with especially large increases in Forsyth, Charlotte-Mecklenburg, and Guilford, and in other urban districts in the Coastal region. In grades 7 and 10 most of the increase was in within-school segregation, with the only large increases in between-school segregation being recorded in Forsyth.

V. THE CORRELATES OF SCHOOL SEGREGATION

Why does segregation within and between public schools persist? Why has racial separation increased in recent years? Although a detailed analysis of these questions is beyond the intended scope of the present Study, it is illuminating at least to examine how segregation correlates with several readily measured characteristics of districts and local areas. These correlations may point to promising directions for further study of school segregation.

Since the demise of dual systems in the South after 1968, public school segregation has been most frequently associated with larger, urban districts in both the South and the North. It is natural to wonder, therefore, whether segregation is equally pervasive in districts of varying size. Segregation might correlate positively with district size for several reasons. Larger districts might simply support a larger number of schools and classrooms, automatically increasing the potential for segregation. Larger communities tend to be more residentially segregated,[47] and this segregation may carry over into classrooms. The greater logistical challenges of transporting students for racial balance might also make larger districts more segregated than smaller ones. In the first panel of Figure 3, we plot the weighted average of the four grades' segregation indices against the logarithm of enrollment in each district. The plot is consistent with this intuition; segregation does rise, non-linearly, with district enrollment. The slope of the depicted regression line is significantly greater than zero; 37% of the variation in segregation is associated with variation in the size of school districts.

Residential segregation has been shown to increase as the size of the minority population increases.[48] Panel B of Figure 3 explores the relationship between segregation and racial composition across school

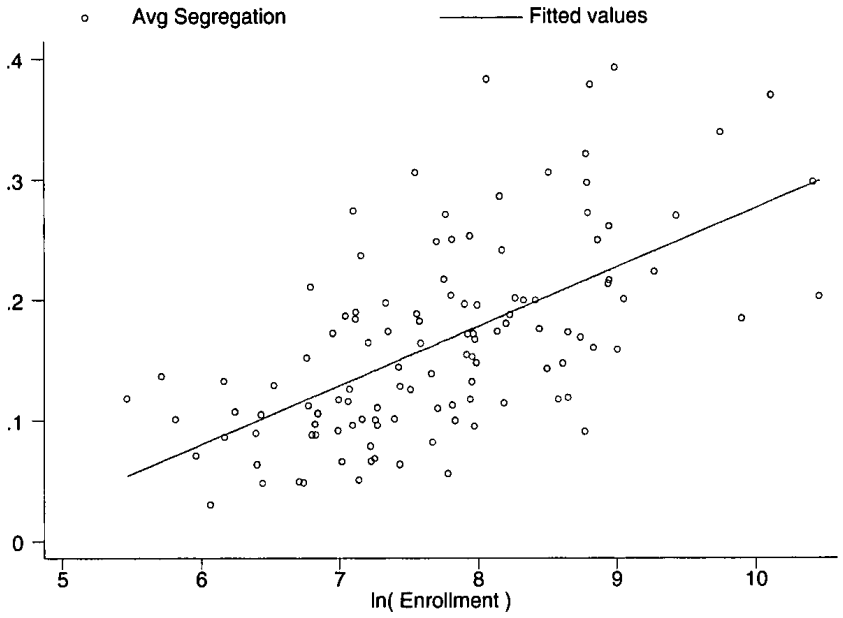
47. David M. Cutler, Edward L. Glaeser & Jacob L. Vigdor, *The Rise and Decline of the American Ghetto*, 107 J. POL. ECON. 455, 457, 495 (1999) (examining residential segregation in American cities).

48. *See id.* at 465–69.

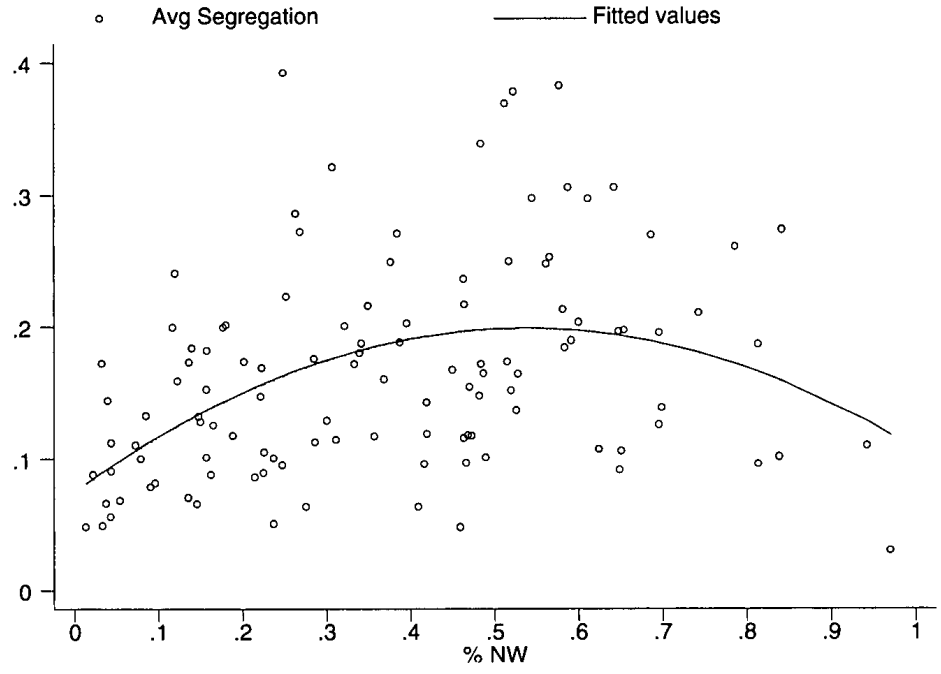
districts. A quadratic, inverted U-shape appears to fit the data, albeit imperfectly, implying that segregation rises with percentage nonwhite, up to a point, and then declines. We examine this relationship further in Figure 4, which arrays districts by their nonwhite percentage in 2000/01. The figure shows the resulting relationships for the four grades, with each bar showing between- and within-school segregation. For the 7th and 10th grades, total segregation was indeed higher in districts with greater proportions of nonwhites, up to proportions between 50% and 60% nonwhite, with about half or more of that segregation being attributable to disparities within schools. The patterns are similar but rougher for the two elementary grades, with most of that segregation attributable to disparities between schools. For all four grades, segregation is highest in racially divided school districts, and lowest in districts with a dominant majority of either whites or nonwhites.

Figure 3. Plots of Average School Segregation for Grades 1, 4, 7, and 10 Against District Enrollment, District Racial Composition, and County Residential Segregation.

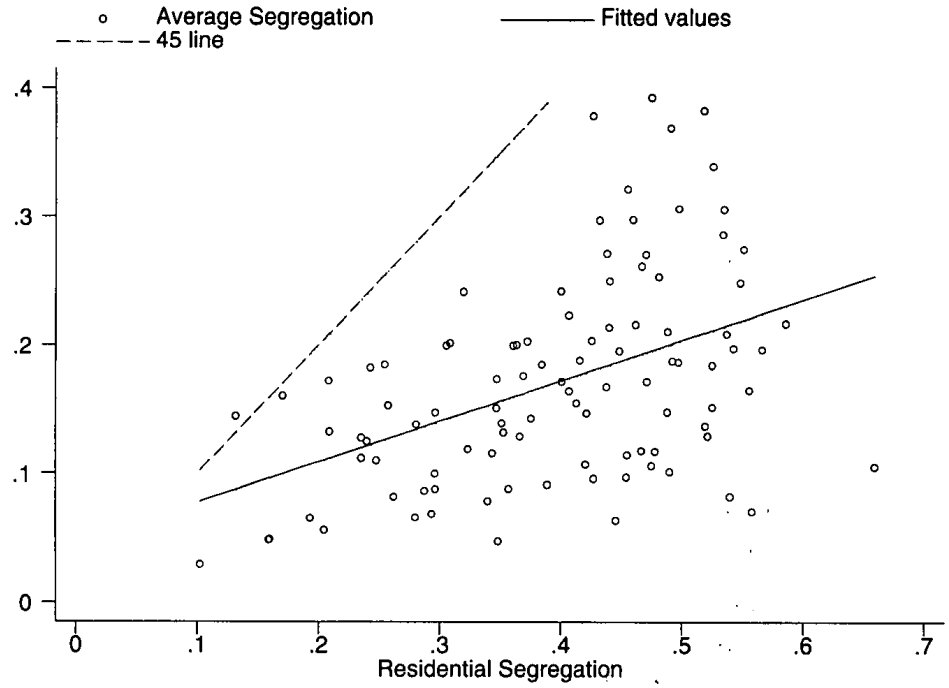
Panel A. District Enrollment (logarithm)



Panel B. Percentage Nonwhite



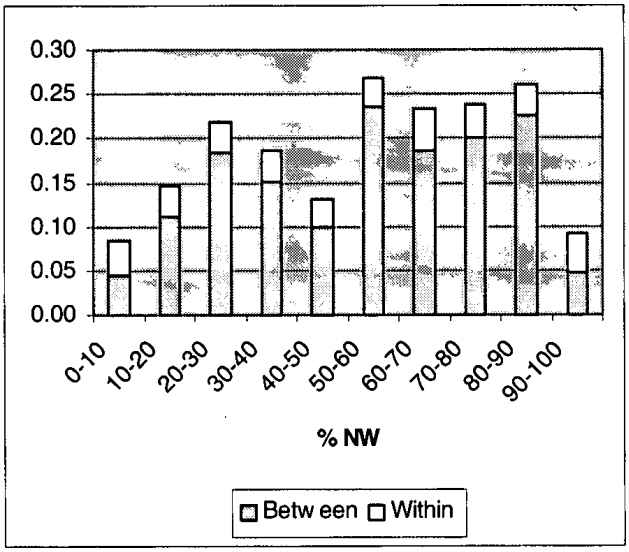
Panel C. County Residential Segregation



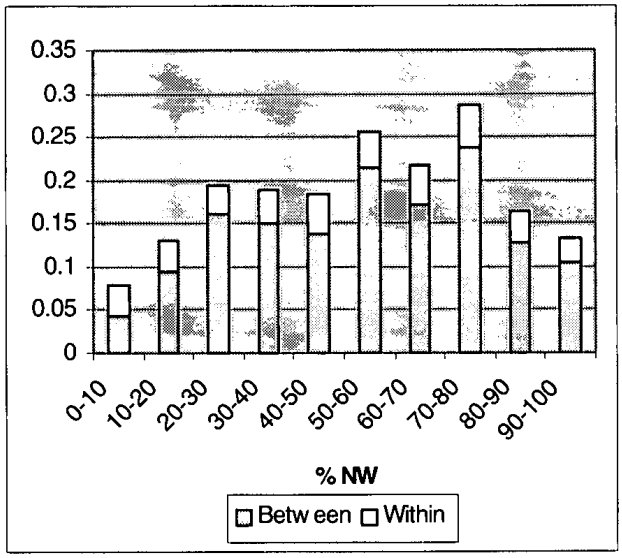
Note: Where S is average segregation (S_k), estimated equations are:
A. $S = 0.03 + 0.05\ (0.007)\ \ln(\text{enrollment})$, $R^2 = 0.37$
B. $S = 0.07 + 0.46\ \%NW - 0.43\ \%NW^2$, $R^2 = 0.2$
C. $S = 0.04 + 0.32\ (0.063)\ RS$, $R^2 = 0.25$
Observations are districts in panels A and B and counties in panel C.

Figure 4. Between- and Within-School Segregation by Percentage Nonwhite Intervals, 2000/01.

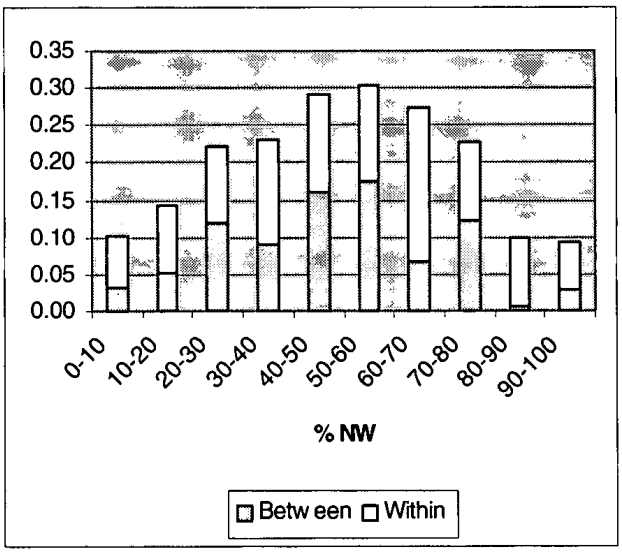
1st Grade



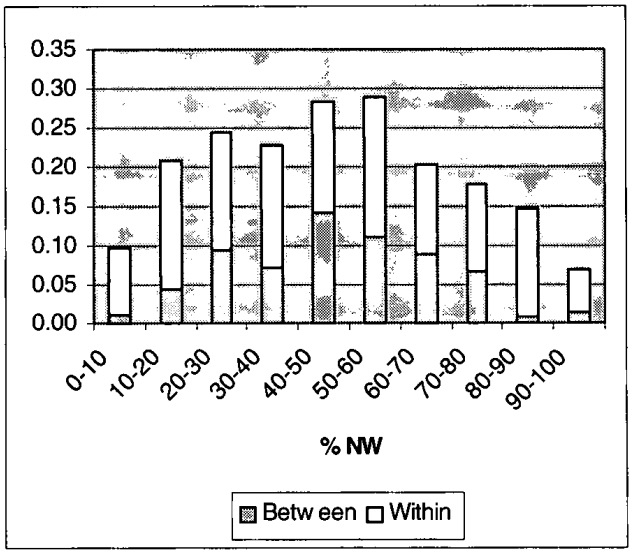
4th Grade



7th Grade



10th Grade



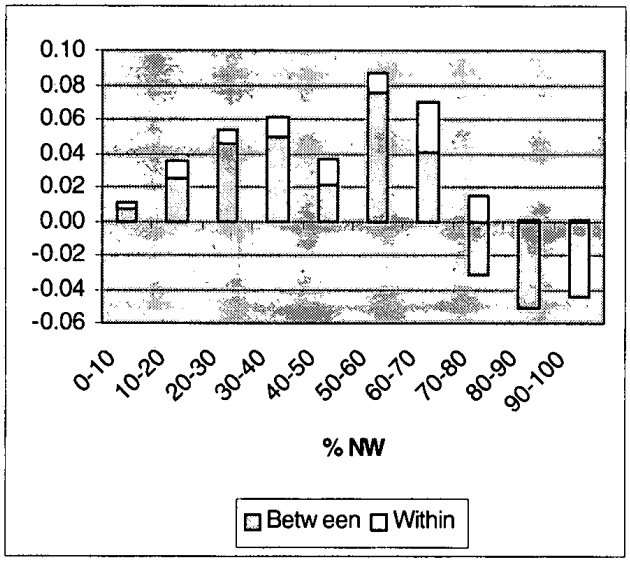
Source: Authors' calculations. Decile averages are based on weighted average of segregation in districts.

Changes in segregation over time also prove to be related to district racial composition. In Figure 5, we array changes in between- and within-school segregation at the district level. Bars that extend on both sides of the 0.00 line indicate that the two components changed in opposite directions, with the net change being the

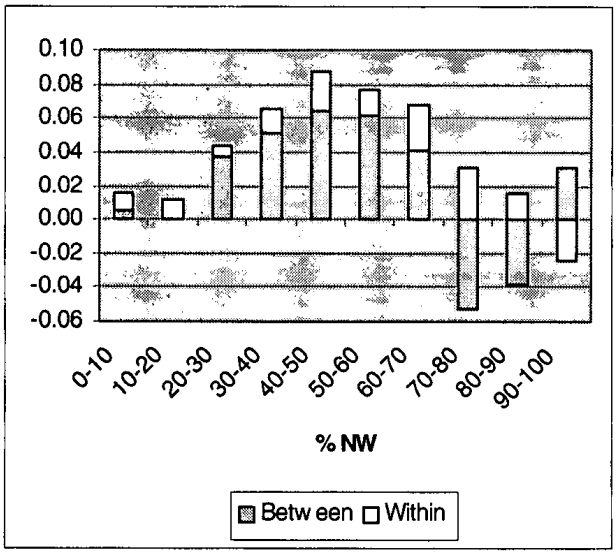
difference between the two. Except for the 10th grade, the districts experiencing the largest increases in segregation tended to be racially divided, with compositions between 20% and 70% nonwhite. Districts at either extreme did not experience large increases in segregation, and in some of them segregation decreased.

Figure 5. Change in Between- and Within-School Segregation by Percentage Nonwhite Intervals, 2000/01–1994/95 Difference.

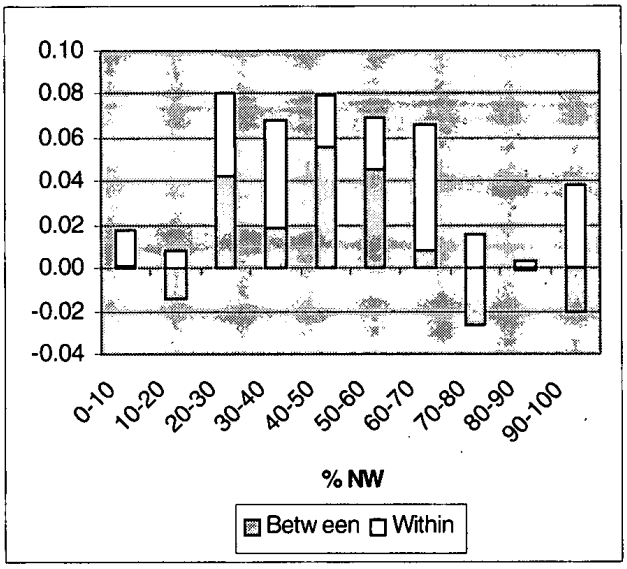
1st Grade



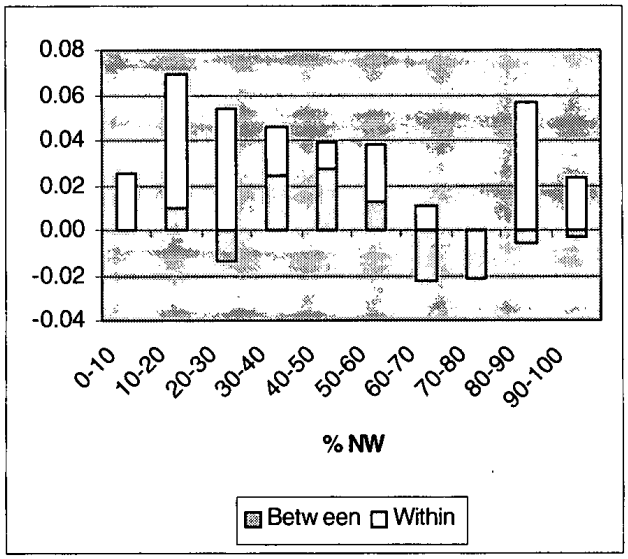
4th Grade



7th Grade



10th Grade



Source: Authors' calculations. Decile averages are based on weighted average of segregation in districts.

In any district with neighborhood-based school assignments, school segregation should be an increasing function of residential segregation. To examine the relationship between segregation in neighborhoods and schools, we used block-level data from the 2000 Census to calculate an alternative version of the segregation index

defined in equation (2) above.[49] This residential segregation index measures the degree to which the racial composition of each block in a county diverges from racial balance. In Panel C of Figure 3, we plot this residential segregation measure against the racial segregation across classrooms for all districts in the county. Aside from the positive relationship between the two measures, this figure shows two important patterns. First, the relationship between neighborhood and school segregation is surprisingly weak. Only a fifth of the variance in school segregation is associated with residential segregation, and many counties with similar levels of segregation across neighborhoods have extremely different levels of segregation between and within schools. Second, all but one point in the graph lies below the 45-degree line, indicating that the average exposure of whites to nonwhites at school exceeds the exposure at and around their own homes. Although North Carolina public schools are segregated, in the sense that schools and classrooms are not racially balanced, they nevertheless offer a more integrated experience than do the state's neighborhoods.[50]

VI. SEGREGATION WITHIN SCHOOLS: SCHOOL-LEVEL ANALYSIS

What we have referred to in this Study as within-school segregation is the portion of a district's segregation that is attributable to racial disparities within schools. This measure, however, is not designed to answer the question, "How segregated are the classrooms in school *j*?" To address this school-level question, it is necessary to define an index of segregation that can be applied to each school, which can easily be done in a manner analogous to the district

49. Our residential segregation index uses block level data, rather than more commonly used tract data, because two North Carolina counties, Camden and Tyrrell, are so sparsely populated that they only constitute one tract. *See* U.S. DEP'T OF COMMERCE, ECON. & STATISTICS ADMIN., U.S. CENSUS BUREAU, CENSUS OF POPULATION AND HOUSING, CENSUS 2000 REDISTRICTING SUMMARY FILE, *at* http://www2.census.gov/census_2000/datasets/redistricting_file—pl_94-171/North_Carolina/ (last visited Mar. 20, 2003) (on file with the North Carolina Law Review). Census tracts are larger than blocks; in North Carolina, there are 1,563 tracts and 86,568 blocks. *See id.* Based on the authors' calculations, the median North Carolinian lives on a block containing 112 persons.

50. Since calculated segregation indices are affected by the number of individuals in the typical unit of observation, residential and school segregation indices are comparable only if the number of children in a typical block is close to the number of students in a typical classroom. This is the case. Since the median North Carolinian lived in a block with 112 residents in 2000, and school-age children were about 19% of the total population (approximately 1.425 million of the state's 8.05 million population were aged 5–18, *see* U.S. BUREAU OF THE CENSUS, *supra* note 25, at 23 tbl.20), the typical block has about 21 children. Our calculations indicate that the average size of the classes in our Study in 2000/01 was 20 in grades 1 and 4 and 17 in grades 7 and 10.

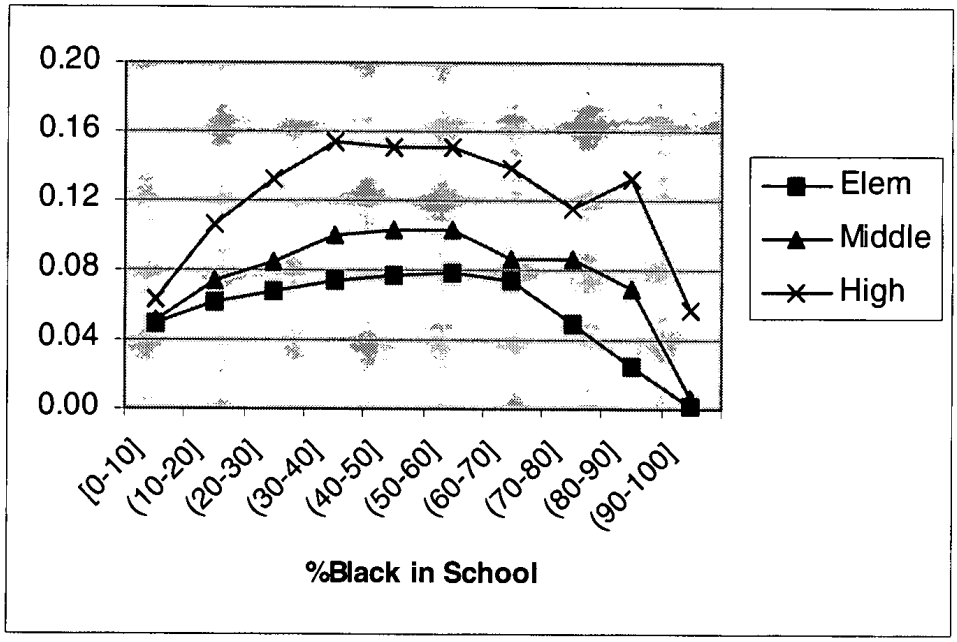
measures defined above. Like the within-school portion of district segregation used above, this new measure is based upon the gap between overall racial composition and the actual exposure rate, but the percentage gap is based on the racial composition of the school rather than the district. We define this alternative measure of within-school segregation so that we can compare calculations based on our North Carolina data to the only previous study using a similar approach of which we are aware. Morgan and McPartland employed a large national survey of enrollment patterns undertaken in the fall of 1976 in which each surveyed school provided information on the student enrollment in eighteen representative classrooms.[51] To make our calculations more comparable to theirs, we follow their lead and focus on whites and blacks rather than whites and nonwhites.[52] As shown in Figure 6, both studies imply that segregation within schools tended to be highest in schools with larger percentages of black students, but only up to a point. In schools with few whites, segregation was lower, though not as low as in virtually all-white schools. Both studies also indicate that within-school segregation tends to be highest in middle schools and high schools. Comparing the degree of segregation within schools, the figure suggests that North Carolina districts in 2000/01 were more segregated than the national average in 1976/77 (based on the Morgan and McPartland study) in middle schools and high schools, but that segregation in elementary schools was low in both samples.

51. *See* Morgan & McPartland, *supra* note 12, at 2.

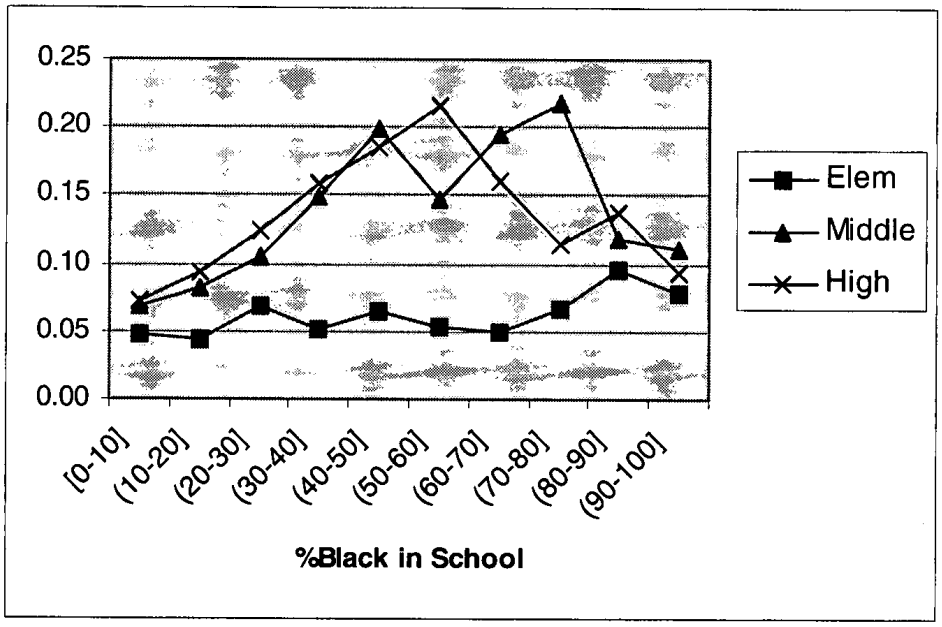
52. *Id.* at 5. Our calculations for this comparison ignore students from other racial groups. Morgan and McPartland actually calculated the index two ways and averaged them. *Id.* at 4. One of the ways—where the nonwhite percentage is replaced by the percent black in equations (1) and (2), *id.*—was identical to our calculations. The second way required the calculation of the exposure rate of blacks to whites (E_{BW}) and then a segregation index defined as S** = (%white - E_{BW}) / %white. *Id.* If all students were either white or black, these measures would yield identical values; because this is not the case generally, the calculated values will generally differ.

Figure 6. Classroom Segregation by Percentage Black in School, Comparison of Two Surveys.

1976/77: Morgan and McPartland, United States



2000/01: Present Study, North Carolina



Source: Top: Morgan and McPartland, *supra* note 12, at 2 tbl.4; bottom: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; School Activity Report Data, 1994/95 and 2000/01; authors' calculations.

Note: Measure of school-level segregation is S_jW^*. *See infra* Appendix B, equation B-6. "(10–20]" denotes greater than 10% and less than or equal to 20%.

VII. SEGREGATION IN METROPOLITAN AREAS

For the bulk of the present Study, we employ a measure of school segregation that takes as its implicit benchmark the racial composition of an entire school district. That is, deviations in racial composition in each classroom and school are measured in relation to the district's overall racial mix. In the previous Section, the benchmark was the racial mix of the individual school. Since a majority of students in the United States live in metropolitan areas,[53] a third natural perspective asks, how great are racial disparities in an entire metropolitan area? In a study of metropolitan areas in the United States, Clotfelter found that the bulk of the segregation in 1994/95 (measured at the school level) was attributable to racial disparities between districts, not racial disparities within districts, and that segregation was most pronounced in the largest metropolitan areas in the Midwest, areas marked by high rates of residential segregation.[54] Because it utilizes school-level data, this previous work on metropolitan segregation cannot, however, examine the relative importance of within-school segregation.

To take this step, we incorporated our classroom-level data into a metropolitan-level analysis to examine the eleven metropolitan areas in North Carolina defined as of 1999. In contrast to most metropolitan areas in the country, fully four of the metro areas in North Carolina were served by a single school district, meaning that, by definition, there can be no segregation arising from racial disparities between districts.[55] Table 5 presents the components of school segregation for the four grades in the eleven metropolitan areas. Not surprisingly, these indices tend to be larger than those for individual districts because the disparities that exist between districts

53. In 1996, 52% of U.S. public school students were in one of 238 metropolitan areas defined as of 1990, and some metropolitan areas had to be excluded from these 238 areas due to data limitations. *See* Charles T. Clotfelter, *Are Whites Still Fleeing? Racial Patterns and Enrollment Shifts in Urban Public Schools, 1987–1996*, 20 J. POL'Y ANALYSIS & MGMT. 199, 203 tbl.1 (2001) (indicating enrollment numbers for public schools in 238 metropolitan areas compared with overall national enrollment). Adding the excluded metropolitan areas and using the 2000 definitions of all metropolitan areas would have increased this percentage, suggesting that well over a majority of public school students were in metropolitan areas in 2000.

54. Clotfelter, *supra* note 1, at 487.

55. In 1998, 22 of 335 metropolitan areas in the United States (or 6.6%), using 1990 metropolitan area definitions, were served by a single school district, a percentage much smaller than that for North Carolina. *See* Beth Aronstamm Young, U.S. DEP'T OF EDUC., NAT'L CTR. FOR EDUC. STATISTICS, CHARACTERISTICS OF THE 100 LARGEST PUBLIC ELEMENTARY AND SECONDARY SCHOOL DISTRICTS IN THE UNITED STATES: 1998–1999, 1–4 (NCES 2000-345, 2000).

add to measured segregation. On average, interdistrict disparities added from 0.06 to 0.08 to segregation in these metro areas. Perhaps surprisingly, the area in which disparities among districts contributed the most to metropolitan segregation was Asheville; although it contained only three school districts, they differed widely in racial composition. Next in terms of interdistrict disparities was Greensboro-Winston-Salem-High Point (hereafter, Greensboro), which contained eleven districts. The table indicates that size and number of districts are generally correlated with segregation, but the relationship is by no means tight. The state's most segregated areas in 2000/01 were Greensboro, Goldsboro, and Charlotte-Gastonia.[56]

Table 5. Segregation in North Carolina Metropolitan Areas, 1994/95 and 2000/01.

	Grade 1		Grade 4		Grade 7		Grade 10	
	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01	1994/95	2000/01
All metropolitan areas								
Total	0.22	0.29	0.21	0.29	0.26	0.33	0.29	0.31
Within schools	0.02	0.03	0.02	0.04	0.10	0.12	0.12	0.14
Between schools	0.13	0.18	0.12	0.17	0.09	0.13	0.10	0.10
Between districts	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.06
Asheville (3)								
Total	0.26	0.25	0.22	0.27	0.27	0.19	0.34	0.27
Within schools	0.02	0.04	0.02	0.03	0.10	0.08	0.14	0.14
Between schools	0.04	0.07	0.04	0.09	0.02	0.04	0.01	0.02
Between districts	0.20	0.14	0.16	0.15	0.15	0.08	0.19	0.11
Charlotte-Gastonia[(a)] (7)								
Total	0.25	0.33	0.25	0.33	0.30	0.39	0.30	0.35
Within schools	0.02	0.03	0.02	0.03	0.11	0.12	0.12	0.14
Between schools	0.16	0.22	0.14	0.20	0.12	0.17	0.12	0.13
Between districts	0.07	0.09	0.08	0.10	0.08	0.10	0.07	0.08
Fayetteville (1)								
Total	0.15	0.18	0.14	0.20	0.18	0.20	0.14	0.17
Within schools	0.02	0.04	0.02	0.04	0.07	0.07	0.07	0.07
Between schools	0.13	0.14	0.12	0.16	0.11	0.13	0.08	0.10
Between districts	0	0	0	0	0	0	0	0

56. Due to the unique data and methodology used in the present Study, it is not possible to make a strict comparison of the segregation indices given for metropolitan areas here to any that have been calculated in other studies for other metropolitan areas. An idea of the relative magnitude can be ascertained, however, by comparing the present segregation indices for grade 4 or grade 7, omitting the within-school component, to calculated (between-school) segregation indices for metropolitan areas. Using grade 4, for example, the segregation index for the most segregated metropolitan area in the state, Greensboro, was 0.37, ignoring within-school disparities; for 7th grade the corresponding index was 0.31. *See supra* Table 5. These indices are lower than that for the Washington metropolitan area in 1994/95 (0.40) and much lower than those of the country's ten most segregated metropolitan areas, whose indices ranged from 0.57 to 0.71 in 1994/95. Clotfelter, *supra* note 1, at 492 tbl.1, 496 tbl.4.

Greensboro-Winston-Salem-High Point (11)								
Total	0.29	0.41	0.28	0.41	0.33	0.42	0.37	0.39
Within schools	0.01	0.02	0.02	0.04	0.11	0.11	0.11	0.13
Between schools	0.14	0.23	0.14	0.22	0.11	0.17	0.14	0.15
Between districts	0.13	0.16	0.11	0.15	0.11	0.14	0.13	0.11
Hickory-Morganton (6)								
Total	0.19	0.21	0.19	0.16	0.13	0.21	0.24	0.24
Within schools	0.03	0.04	0.03	0.03	0.06	0.12	0.13	0.14
Between schools	0.10	0.11	0.10	0.06	0.05	0.03	0.05	0.02
Between districts	0.06	0.07	0.06	0.07	0.03	0.05	0.06	0.07
Jacksonville (1)								
Total	0.16	0.16	0.12	0.18	0.12	0.16	0.16	0.14
Within schools	0.02	0.05	0.02	0.05	0.05	0.07	0.08	0.06
Between schools	0.14	0.11	0.10	0.13	0.07	0.08	0.08	0.08
Between districts	0	0	0	0	0	0	0	0
Wilmington (2)								
Total	0.09	0.15	0.09	0.17	0.08	0.18	0.15	0.23
Within schools	0.01	0.04	0.02	0.06	0.06	0.12	0.10	0.13
Between schools	0.07	0.11	0.07	0.11	0.01	0.06	0.05	0.10
Between districts	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rocky Mount (2)								
Total	0.25	0.28	0.22	0.25	0.25	0.30	0.25	0.25
Within schools	0.02	0.04	0.02	0.05	0.15	0.21	0.17	0.20
Between schools	0.23	0.23	0.21	0.21	0.10	0.08	0.07	0.05
Between districts	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Raleigh-Durham-Chapel Hill (7)								
Total	0.18	0.23	0.19	0.23	0.25	0.30	0.30	0.29
Within schools	0.02	0.03	0.02	0.04	0.11	0.15	0.14	0.17
Between schools	0.11	0.13	0.11	0.12	0.07	0.07	0.08	0.06
Between districts	0.06	0.07	0.06	0.06	0.07	0.08	0.07	0.05
Goldsboro (1)								
Total	0.35	0.36	0.17	0.32	0.41	0.49	0.35	0.35
Within schools	0.05	0.04	0.05	0.04	0.03	0.08	0.08	0.08
Between schools	0.30	0.32	0.12	0.28	0.38	0.40	0.27	0.27
Between districts	0	0	0	0	0	0	0	0
Greenville (1)								
Total	0.06	0.13	0.07	0.13	0.10	0.26	0.26	0.30
Within schools	0.01	0.04	0.01	0.02	0.04	0.14	0.23	0.23
Between schools	0.05	0.09	0.06	0.11	0.06	0.11	0.03	0.06
Between districts	0	0	0	0	0	0	0	0

(a) Includes only the North Carolina counties in Charlotte-Gastonia-Rock Hill MSA.
Note: Number of districts in each metropolitan area given in parentheses.
Total segregation is S_m, within-school segregation is S_m^W, between-school segregation is S_m^B, and between-district segregation is S_m^D. *See infra* Appendix B.
Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; School Activity Report Data, 1994/95 and 2000/01; authors' calculations.

As for trends in segregation, most of the metropolitan areas showed increases over the six-year period, with Greensboro, Greenville, Wilmington, and Charlotte showing especially large increases. These increases in school segregation are all the more striking in that they occurred during a period of *decreasing* residential

segregation. Measured by Glaeser and Vigdor's index of isolation,[57] residential segregation declined between 1990 and 2000 in all but one of North Carolina's metropolitan areas.[58] Furthermore, two of the three areas where this index of residential segregation declined the most (Wilmington and Greensboro) were the two where our index of school segregation *increased* the most.[59] Evidently, the increases we observe in school segregation do not appear to be explained by rising residential segregation.

CONCLUSION

This Study analyzes racial segregation in the public schools of North Carolina. It does so employing data on racial composition at the classroom level. Consistent with other studies of segregation in the schools, we find that the public schools of this state, like others of the region, evince little of the extreme segregation that marked the period before the 1960s, although segregation in a few large urban districts was much higher than the state average. Measured on a metropolitan basis, school segregation was higher than when viewed within districts only, but appeared to be well below the levels of the country's most segregated metropolitan areas.

The Study contributes to the literature on school segregation by measuring the extent of segregation within schools throughout a large and heterogeneous state. We develop a method for distinguishing such within-school segregation from the between-school segregation that has been the subject of most studies of school segregation. Our analysis suggests that within-school segregation is much less important in elementary grades than in middle school and high

57. Edward L. Glaeser & Jacob L. Vigdor, *Racial Segregation: Promising News*, *in* 1 REDEFINING URBAN AND SUBURBAN AMERICA: EVIDENCE FROM CENSUS 2000, at 211, 212 & n.3 (Bruce Katz & Robert E. Lang eds., 2003) (defining the isolation index as the percentage of nonwhite residents in the census tract where the average nonwhite resident lives).

58. *Id.* at 216–19, 227–33 tbl.11A-1.

59. The Cutler-Glaeser-Vigdor index of residential isolation—*see* Cutler, Glaeser & Vigdor, *supra* note 47, at 459 (explaining the isolation index as the percentage of nonwhite residents in the census tract where the average nonwhite resident lives)—declined 0.160 in Wilmington and 0.103 in Greensboro over the decade. The average of the segregation indices for the four grades increased in those areas by 0.08 and 0.09, respectively. *See* Glaeser & Vigdor, *supra* note 57, at 227–33 tbl.11A-1. Greenville, where average school segregation increased by 0.0825, had a decline of –0.063 in the index of isolation. The decline in Greenville is based on authors' calculations, using data from the U.S. Census Bureau. *See* U.S. DEP'T OF COMMERCE, ECON. AND STATISTICS ADMIN., U.S. CENSUS BUREAU, CENSUS OF POPULATION AND HOUSING, 1990, SUMMARY TAPE FILE 1A; *see also* Glaeser & Vigdor, *supra* note 57, at 233 tbl.11A-1 (showing an isolation index of 0.162 for Greenville in 2000).

school. Within-school segregation accounts for roughly a fifth of the total segregation in grades 1 and 4, while it is about half the total in grade 7 and more than half in grade 10. We find that between-school segregation in districts tends to be higher in districts with larger proportions of nonwhites, peaking in districts between 50% and 70% nonwhite.

Apart from the between/within distinction, perhaps the most arresting finding in the Study is the marked increase in measured segregation over the six-year period from 1994/95 to 2000/01, an increase we observed at all levels and for a variety of measures. Whether this change is part of a permanent reversal of forty-year-old trends or merely a temporary blip is unclear at this time, but it is a trend worth continued scrutiny.

APPENDIX A: SELECTED DATA FOR DISTRICTS

Table A1. Enrollment, Racial Composition, Growth Rate, and Segregation by District

County	School district	District group	Enrollment	Percentage of students			Growth rate 95–01*	2000/01 Segregation in schools				1994/95 Segregation in schools			
				Black	Hispanic	Other nonwhite		4th Grade		10th Grade		4th Grade		10th Grade	
								Within	Between	Within	Between	Within	Between	Within	Between
Alamance	Alamance-Burlington	UP	20,893	26.3	8.0	1.6	2.8	0.01	0.18	0.14	0.16	0.04	0.08	0.09	0.08
Alexander	Alexander	RM	5,432	6.1	3.1	3.7	1.6	0.03	0.09	0.15	0.00	0.01	0.20	0.11	0.00
Alleghany	Alleghany	RM	1,412	1.6	5.3	0.0	-0.7	0.05	0.04	0.24	0.00	0.03	0.01	0.04	0.00
Anson	Anson	RP	4,482	63.5	0.6	1.7	0.3	0.07	0.16	0.10	0.02	0.07	0.12	0.20	0.00
Ashe	Ashe	RM	3,196	1.2	1.5	0.4	-1.4	0.03	0.01	0.46	0.00	0.02	0.01	0.03	0.00
Avery	Avery	RM	2,431	1.1	1.2	0.2	0.1	0.04	0.02	0.06	0.00	0.00	0.06	0.16	0.00
Beaufort	Beaufort	RC	7,396	42.4	3.1	0.2	-0.8	0.08	0.13	0.14	0.04	0.02	0.13	0.16	0.07
Bertie	Bertie	RC	3,637	82.8	0.5	0.4	-1.6	0.07	0.30	0.12	0.00	0.02	0.17	0.08	0.00
Bladen	Bladen	RP	5,695	50.5	3.2	1.1	0.7	0.07	0.18	0.19	0.05	0.02	0.12	0.08	0.12
Brunswick	Brunswick	RC	10,288	24.7	2.2	0.9	2.3	0.04	0.04	0.06	0.07	0.03	0.04	0.08	0.01
Buncombe	Buncombe	UM	25,058	7.5	2.7	1.1	0.8	0.03	0.13	0.14	0.04	0.03	0.08	0.06	0.03
Buncombe	Asheville City	UM	4,028	44.7	3.6	0.7	-2.4	0.05	0.03	0.20	0.00	0.03	0.00	0.25	0.00
Burke	Burke	RM	14,518	8.1	3.3	9.6	1.9	0.03	0.07	0.15	0.02	0.02	0.15	0.22	0.05
Cabarrus	Cabarrus	UP	19,088	14.4	4.6	1.4	4.0	0.05	0.10	0.18	0.03	0.01	0.06	0.11	0.03
Cabarrus	Kannapolis City	UP	4,265	30.6	8.5	1.5	1.1	0.03	0.04	0.16	0.00	0.02	0.01	0.08	0.00
Caldwell	Caldwell	RM	12,562	8.5	2.1	0.7	1.3	0.02	0.09	0.12	0.08	0.01	0.13	0.07	0.05
Camden	Camden	RC	1,277	19.5	0.3	0.9	0.9	0.01	0.00	0.10	0.00	0.04	0.00	0.05	0.00
Carteret	Carteret	RC	8,456	11.8	1.3	0.9	0.6	0.05	0.05	0.12	0.02	0.02	0.09	0.09	0.01
Caswell	Caswell	RP	3,571	44.0	1.3	0.1	0.7	0.03	0.03	0.12	0.01	0.01	0.12	0.07	0.00
Catawba	Catawba	UM	16,437	8.0	4.0	6.6	3.1	0.03	0.04	0.11	0.01	0.03	0.11	0.08	0.02
Catawba	Hickory City	UM	4,579	27.9	8.1	9.9	1.1	0.02	0.07	0.29	0.00	0.07	0.01	0.15	0.15
Catawba	Newton-Conover City	UM	2,773	19.2	9.4	7.6	-0.1	0.01	0.05	0.20	0.00	0.07	0.05	0.09	0.00
Chatham	Chatham	RP	7,298	24.8	11.1	1.0	2.4	0.02	0.31	0.19	0.06	0.02	0.05	0.13	0.03
Cherokee	Cherokee	RM	3,639	2.8	1.2	2.1	0.9	0.01	0.04	0.05	0.00	0.02	0.03	0.03	0.01
Chowan	Edenton-Chowan	RC	2,460	50.1	0.7	0.2	-0.8	0.05	0.14	0.13	0.00	0.04	0.01	0.12	0.00
Clay	Clay	RM	1,258	1.1	0.4	0.4	0.7			0.03	0.00			0.03	0.00
Cleveland	Cleveland	RM	9,551	23.6	1.2	0.2	2.0	0.03	0.05	0.13	0.00	0.02	0.05	0.07	0.00

Cleveland	Kings Mountain City	UM	4,416	23.8	0.9	2.5	1.8	0.01	0.01	0.10	0.00	0.01	0.03	0.04	0.00
Cleveland	Shelby City	UM	3,205	57.3	1.2	0.7	-0.1	0.03	0.00	0.25	0.00	0.01	0.00	0.18	0.00
Columbus	Columbus	RP	7,310	42.0	2.4	5.6	-0.8	0.06	0.16	0.12	0.07	0.01	0.18	0.10	0.12
Columbus	Whiteville City	UP	2,756	46.1	1.1	1.1	-0.1	0.09	0.00	0.14	0.00	0.02	0.00	0.12	0.00
Craven	Craven	UC	14,769	36.2	2.8	1.2	0.4	0.04	0.11	0.12	0.01	0.01	0.08	0.17	0.00
Cumberland	Cumberland	-	50,927	48.4	5.3	3.3	0.4	0.04	0.16	0.07	0.10	0.02	0.12	0.07	0.08
Currituck	Currituck	RC	3,213	10.6	1.3	0.8	1.6	0.04	0.03	0.07	0.00	0.01	0.05	0.11	0.00
Dare	Dare	RC	4,658	4.9	2.2	0.4	3.0	0.05	0.07	0.10	0.01	0.03	0.07	0.17	0.02
Davidson	Davidson	RP	18,998	2.5	1.1	0.9	1.7	0.05	0.05	0.08	0.02	0.02	0.03	0.04	0.02
Davidson	Lexington City	UP	3,234	47.9	14.6	6.6	1.4	0.11	0.00	0.18	0.00	0.06	0.00	0.09	0.00
Davidson	Thomasville City	UP	2,407	49.1	11.0	1.6	2.2	0.11	0.00	0.18	0.00	0.03	0.00	0.28	0.00
Davie	Davie	RM	5,728	10.1	3.7	0.4	3.2	0.04	0.05	0.21	0.00	0.02	0.06	0.08	0.00
Duplin	Duplin	RC	8,558	36.4	15.2	0.2	0.8	0.05	0.17	0.17	0.17	0.01	0.13	0.13	0.13
Durham	Durham	UP	30,759	59.9	5.8	2.5	1.8	0.05	0.24	0.19	0.10	0.01	0.32	0.12	0.22
Edgecombe	Edgecombe	UC	7,559	58.3	3.5	0.1	-1.0	0.09	0.06	0.13	0.05	0.02	0.05	0.08	0.10
Forsyth	Winston-Salem/Forsyth	-	45,914	39.0	6.5	1.3	2.6	0.06	0.32	0.15	0.11	0.03	0.10	0.15	0.04
Franklin	Franklin	RP	7,651	40.4	4.3	0.8	2.6	0.07	0.05	0.12	0.08	0.02	0.14	0.18	0.10
Gaston	Gaston	UM	30,570	20.7	2.6	1.4	0.9	0.02	0.20	0.13	0.08	0.02	0.19	0.08	0.07
Gates	Gates	RC	2,033	43.7	0.0	0.5	1.3	0.01	0.00	0.09	0.00	0.03	0.00	0.07	0.00
Graham	Graham	RM	1,208	0.4	0.1	12.8	-0.2	0.05	0.00	0.07	0.00	0.04	0.00	0.11	0.00
Granville	Granville	RP	8,121	39.7	3.6	0.6	2.7	0.01	0.10	0.13	0.09	0.04	0.10	0.10	0.04
Greene	Greene	RC	3,007	52.6	10.4	0.2	1.5	0.03	0.00	0.12	0.00	0.02	0.00	0.16	0.00
Guilford	Guilford	-	63,585	41.9	3.3	4.4	2.3	0.04	0.32	0.11	0.26	0.02	0.26	0.11	0.28
Halifax	Halifax	RP	6,008	88.1	0.6	5.5	-0.8	0.03	0.13	0.06	0.02	0.05	0.09	0.03	0.02
Halifax	Roanoke Rapids City	UP	3,061	20.7	0.9	2.0	-0.3	0.03	0.01	0.07	0.00	0.01	0.00	0.07	0.00
Halifax	Weldon City	RP	1,135	94.9	0.2	0.3	-1.3	0.02	0.00	0.03	0.00	0.03	0.01	0.03	0.00
Harnett	Harnett	RP	16,418	32.2	5.8	1.3	3.6	0.03	0.06	0.14	0.01	0.02	0.06	0.10	0.00
Haywood	Haywood	RM	7,777	2.1	1.6	0.8	1.4	0.01	0.03	0.06	0.01	0.02	0.05	0.06	0.00
Henderson	Henderson	RM	11,753	6.5	7.5	1.1	1.6	0.05	0.08	0.32	0.03	0.02	0.10	0.12	0.06
Hertford	Hertford	RC	3,923	80.1	0.5	1.4	-1.7	0.04	0.01	0.17	0.00	0.03	0.04	0.07	0.00
Hoke	Hoke	RP	6,198	49.3	4.8	14.7	1.5	0.02	0.10	0.08	0.00	0.01	0.22	0.08	0.01
Hyde	Hyde	RC	684	46.9	2.3	0.3	-2.5	0.02	0.11	0.07	0.00	0.00	0.19	0.06	0.07
Iredell	Iredell-Statesville	RM	17,692	19.0	4.0	2.7	4.2	0.04	0.19	0.22	0.13	0.02	0.13	0.11	0.13
Iredell	Mooresville City	UM	4,186	18.4	1.2	1.9	4.3	0.01	0.00	0.17	0.00	0.06	0.02	0.15	0.00
Jackson	Jackson	RM	3,532	1.8	1.3	10.6	0.5	0.05	0.17	0.07	0.02	0.01	0.16	0.05	0.02

Johnston	Johnston	RP	21,290	22.3	7.9	0.6	4.7	0.04	0.14	0.18	0.04	0.02	0.08	0.14	0.05
Jones	Jones	RC	1,455	56.2	2.5	0.5	-0.8	0.04	0.14	0.08	0.00	0.02	0.03	0.04	0.00
Lee	Lee	RP	8,871	28.1	14.8	1.3	1.6	0.02	0.05	0.23	0.00	0.01	0.10	0.17	0.00
Lenoir	Lenoir	UC	10,355	52.0	3.5	0.4	-0.1	0.07	0.34	0.19	0.14	0.01	0.41	0.14	0.18
Lincoln	Lincoln	RM	11,046	9.5	6.6	0.8	3.2	0.03	0.10	0.10	0.13	0.02	0.06	0.07	0.06
Macon	Macon	RM	4,020	1.3	1.3	0.9	1.8	0.03	0.02	0.08	0.00	0.05	0.01	0.06	0.01
Madison	Madison	RM	2,529	0.3	0.9	0.2	0.1	0.04	0.02	0.04	0.00	0.03	0.01	0.08	0.00
Martin	Martin	RC	4,767	57.7	1.6	0.3	-0.7	0.05	0.23	0.11	0.24	0.03	0.14	0.13	0.09
McDowell	McDowell	RM	6,434	4.9	3.0	2.5	1.1	0.02	0.08	0.09	0.00	0.05	0.08	0.13	0.00
Mecklenburg	Charlotte-Mecklenburg	-	104,260	43.1	5.5	4.9	3.4	0.03	0.24	0.17	0.13	0.03	0.14	0.16	0.10
Mitchell	Mitchell	RM	2,379	0.7	3.0	0.3	0.2	0.05	0.01	0.05	0.00	0.03	0.05		
Montgomery	Montgomery	RP	4,493	28.8	13.8	3.5	1.2	0.01	0.13	0.17	0.02	0.02	0.11	0.10	0.01
Moore	Moore	RP	11,281	25.5	4.8	1.3	2.1	0.02	0.13	0.18	0.03	0.04	0.07	0.12	0.10
Nash	Nash-Rocky Mount	UP	18,707	54.8	3.4	1.4	1.2	0.03	0.27	0.23	0.04	0.01	0.29	0.21	0.06
New Hanover	New Hanover	UC	21,690	29.8	1.5	1.5	0.9	0.07	0.14	0.15	0.12	0.01	0.09	0.11	0.06
Northampton	Northampton	RP	3,605	81.0	0.6	0.1	-0.8	0.01	0.18	0.15	0.04	0.02	0.26	0.11	0.06
Onslow	Onslow	UC	20,937	28.6	4.0	2.7	0.7	0.05	0.13	0.06	0.08	0.02	0.10	0.08	0.08
Orange	Orange	UP	6,637	24.3	3.3	0.9	2.9	0.03	0.04	0.11	0.00	0.03	0.04	0.16	0.00
Orange	Chapel Hill-Carrboro	UP	9,599	18.8	5.2	8.8	3.8	0.06	0.04	0.27	0.00	0.04	0.02	0.22	0.00
Pamlico	Pamlico	RC	2,103	30.4	1.1	1.2	-0.3	0.01	0.04	0.11	0.00	0.03	0.00	0.05	0.00
Pasquotank	Elizabeth City-Pasquotank	UC	5,958	49.8	0.7	0.9	-0.6	0.03	0.12	0.17	0.00	0.02	0.09	0.08	0.00
Pender	Pender	RC	6,563	31.6	3.6	0.3	3.3	0.05	0.06	0.13	0.05	0.01	0.11	0.10	0.03
Perquimans	Perquimans	RC	1,776	37.8	0.6	0.3	-1.3	0.05	0.00	0.09	0.00	0.01	0.00	0.16	0.00
Person	Person	RP	5,962	37.6	1.9	0.6	1.8	0.02	0.25	0.10	0.00	0.02	0.18	0.19	0.00
Pitt	Pitt	UC	19,977	51.3	2.6	1.4	0.9	0.02	0.11	0.23	0.06	0.01	0.06	0.23	0.03
Polk	Polk	RM	2,403	10.3	4.9	0.7	2.3	0.02	0.05	0.11	0.00	0.01	0.01	0.09	0.00
Randolph	Randolph	RP	17,244	5.7	5.3	1.1	2.6	0.04	0.10	0.23	0.02	0.03	0.06	0.10	0.06
Randolph	Asheboro City	UP	4,283	17.3	20.0	2.7	1.9	0.03	0.04	0.47	0.00	0.00	0.04	0.16	0.00
Richmond	Richmond	RP	8,295	41.5	2.6	2.6	0.1	0.05	0.04	0.16	0.00	0.03	0.06	0.11	0.00
Robeson	Robeson	RP	23,980	31.8	2.8	43.5	0.8	0.04	0.25	0.11	0.12	0.02	0.28	0.10	0.18
Rockingham	Rockingham	RP	14,585	26.5	3.1	0.7	0.4	0.02	0.14	0.10	0.08	0.02	0.10	0.08	0.09
Rowan	Rowan-Salisbury	RP	20,359	23.3	3.9	1.6	1.9	0.04	0.24	0.12	0.23	0.01	0.25	0.08	0.26
Rutherford	Rutherford	RM	10,171	17.1	1.8	0.5	0.5	0.02	0.22	0.11	0.03	0.02	0.13	0.13	0.01
Sampson	Sampson	RP	7,863	33.2	12.8	1.4	2.2	0.04	0.09	0.16	0.07	0.02	0.13	0.08	0.10

Sampson	Clinton City	UP	2,599	49.4	6.2	4.5	0.4	0.04	0.00	0.31	0.00	0.01	0.00	0.26	0.00
Scotland	Scotland	RP	7,135	47.9	0.7	11.5	0.0	0.06	0.15	0.17	0.08	0.02	0.13	0.15	0.01
Stanly	Stanly	RP	10,170	16.6	2.4	4.3	1.6	0.05	0.21	0.16	0.15	0.13	0.07	0.05	0.07
Stokes	Stokes	RP	7,332	6.0	1.4	0.2	1.9	0.06	0.09	0.06	0.04	0.05	0.09	0.04	0.00
Surry	Surry	RM	8,432	4.7	8.6	0.8	1.5	0.04	0.08	0.32	0.01	0.02	0.02	0.42	0.01
Surry	Elkin City	RM	1,116	6.5	8.9	0.5	1.3	0.04	0.00	0.39	0.00	0.01	0.00	0.10	0.00
Surry	Mount Airy City	UM	1,901	12.5	4.8	6.3	-0.1	0.04	0.00	0.19	0.00	0.02	0.03	0.07	0.00
Swain	Swain	RM	1,749	0.8	1.1	20.8	1.1	0.02	0.09	0.10	0.00	0.04	0.13	0.06	0.00
Transylvania	Transylvania	RM	4,069	7.6	0.6	0.7	0.5	0.03	0.04	0.04	0.03	0.04	0.03	0.05	0.04
Tyrrell	Tyrrell	RC	726	47.2	2.5	0.3	-0.8	0.16	0.00	0.12	0.00	0.00	0.00	0.11	0.00
Union	Union	RP	23,007	18.2	5.6	0.8	4.6	0.03	0.34	0.09	0.32	0.01	0.24	0.08	0.26
Vance	Vance	RP	8,317	63.2	4.0	0.6	2.5	0.01	0.15	0.13	0.01	0.02	0.16	0.16	0.00
Wake	Wake	-	98,975	27.7	4.6	4.2	4.2	0.05	0.10	0.17	0.07	0.02	0.06	0.16	0.05
Warren	Warren	RP	3,248	72.4	1.0	7.0	1.0	0.03	0.04	0.09	0.00	0.01	0.20	0.08	0.00
Washington	Washington	RC	2,289	71.4	1.0	0.3	-2.3	0.10	0.14	0.10	0.05	0.00	0.03	0.14	0.06
Watauga	Watauga	RM	4,891	2.5	1.0	0.6	0.3	0.02	0.06	0.06	0.00	0.03	0.01	0.04	0.00
Wayne	Wayne	UC	19,419	45.4	4.5	1.1	0.8	0.04	0.28	0.08	0.27	0.05	0.12	0.08	0.27
Wilkes	Wilkes	RM	10,384	5.7	3.7	0.5	1.0	0.04	0.11	0.23	0.16	0.02	0.20	0.14	0.13
Wilson	Wilson	UC	12,582	54.3	6.0	0.6	0.9	0.05	0.32	0.12	0.05	0.01	0.06	0.19	0.00
Yadkin	Yadkin	RM	5,845	4.6	8.9	0.4	2.3	0.02	0.07	0.33	0.00	0.01	0.03	0.11	0.00
Yancey	Yancey	RM	2,505	1.0	3.6	0.3	1.0	0.07	0.02	0.03	0.00	0.01	0.05	0.07	0.00
State of NC			1,281,201	31.1	4.4	3.3	1.9	0.04	0.16	0.15	0.09	0.02	0.12	0.12	0.08

* Exponential growth rate in enrollment 1994/95–2000/01.

Source: North Carolina Department of Public Instruction, North Carolina Education Research Data Center; School Activity Report, Membership Data and North Carolina Public Schools Statistical Profile, 1994/95 and 2000/01; authors' calculations.

Note: District groups based on combinations of urban (U) or rural (R) and region: mountain (M), piedmont (P), or coastal (C).

APPENDIX B

DEFINITIONS OF MEASURES OF INTERRACIAL CONTACT AND SEGREGATION

District-Level Measures

Calculated exposure rates and segregation indices presented in the Study employ data on classrooms (denoted *i*), schools (*j*), and districts (*k*). For most calculations, students are divided into whites and nonwhites, where W_{ij} is, for example, the number of white students in classroom *i*, school *j* in a particular grade in a given district. For any district *k*, the exposure rate of whites to nonwhites for a particular grade is

$$E_k = [\Sigma\Sigma\ W_{ij}\ \%NW_{ij}\ ] / \Sigma\Sigma\ W_{ij}, \qquad \text{(B-1)}$$

where $\%NW_{ij}$ is the percentage nonwhite in classroom *i*, school *j*. This rate is equal to the percentage nonwhite in the typical white student's classroom. As noted in the text, we performed these calculations for classes that contained any students in grades 1, 4, 7, or 10.

This exact exposure rate can be compared to the exposure rate based on school-wide racial composition:

$$E_k^* = [\Sigma\ W_j\ \%NW_j\ ] / \Sigma\ W_j, \qquad \text{(B-2)}$$

where W_j is the number of whites in school *j* and $\%NW_j$ is its nonwhite percentage.[60] Whereas E_k gives the racial composition of the typical white student's classroom, E_k^* gives the racial composition of that student's *school*. Unless the classrooms in each school are racially balanced at that school's racial composition, this exposure rate will be lower than the exposure rate defined above, using school racial compositions (E_k^*). Thus,

$$E_k \leq E_k^* \leq \%NW_k.$$

Segregation in district *k* is defined as the percentage gap between the maximum exposure rate, which would result from racial balance throughout all schools and classrooms in a district, and actual exposure E_k:

60. The exposure rate of group *X* students to group *Y* students is sometimes written as ${}_xP_y$.

$$S_k = (\%NW_k - E_k) / \%NW_k . \qquad \text{(B-3)}$$

This segregation can be decomposed into two components: (1) the portion due to racial disparities at the classroom level, within schools:

$$S_k^W = (E_k^* - E_k) / \%NW_k , \qquad \text{(B-4)}$$

and (2) the portion due to racial disparities between schools, within a district (as defined in the text):

$$S_k^B = (\%NW_k - E_k^*) / \%NW_k . \qquad \text{(B-5)}$$

Note that S_k^B is the conventional measure of segregation, based on school-level data alone.

School-Level Measures

To address questions related to segregation at the level of the school, it is necessary to employ a school-level measure of segregation. A measure that is exactly analogous to the district measures defined above is

$$S_j^{W*} = (\%NW_j - E_j) / \%NW_j , \qquad \text{(B-6)}$$

where the exposure rate for the school is

$$E_j = [\Sigma\, W_{ij}\ \%NW_{ij}\,] / \Sigma\, W_{ij} . \qquad \text{(B-7)}$$

This measure of segregation is based on the gap between actual interracial exposure in a school and the school's overall racial composition. In this respect it is the same as the within-school portion of district segregation, but the denominator in this case is the school's, and not the district's, racial composition. In the calculations presented in the paper, the two racial groups used are whites and blacks, in order to be comparable to the previous similar study.

Metropolitan-Level Measures

In a manner analogous to the calculations at the district level, we also made calculations at the level of the metropolitan area for the eleven metropolitan areas in North Carolina defined as of 1999. (Lacking detailed enrollment data on other states, we included only the portion of the Charlotte-Gastonia-Rock Hill MSA that was in North Carolina). Racial segregation in the public schools may arise because of racial disparities within schools, disparities between schools in the same district, or disparities among districts in the same metropolitan area. To separate these three components of

segregation, we calculate the actual exposure rate for all schools in a metro area and compare that actual rate to two hypothetical exposure rates. For all the schools in a metro area m, the actual exposure rate (the nonwhite percentage in the average white student's classroom) is simply a weighted average of classroom racial compositions where the numbers of whites are the weights:

$$E_m = [\Sigma \Sigma \Sigma \, W_{ijk} \;\; \%NW_{ijk} \,] / \Sigma \Sigma \Sigma \, W_{ijk} \,, \qquad \text{(B-8)}$$

where W_{ijk} and $\%NW_{ijk}$ are, respectively, the number of white students and the percentage nonwhite in classroom i, school j, and district k.

If the classrooms within each school were racially balanced, the exposure rate would instead be measured by a weighted average of school racial compositions. Call this hypothetical exposure rate

$$E_m{}^* = [\Sigma \Sigma \, W_{jk} \;\; \%NW_{jk} \,] / \Sigma \Sigma \, W_{jk} \,, \qquad \text{(B-9)}$$

where W_{jk} and $\%NW_{jk}$ are, respectively, the number of white students and the percentage nonwhite in school j and district k.

A second hypothetical exposure rate is simply a weighted average of the racial compositions of districts in a metro area—the racial composition of the school district attended by the average white student in the metro area. This rate is

$$E_m{}^{**} = [\Sigma \, W_k \;\; \%NW_k \,] / \Sigma \, W_k \,, \qquad \text{(B-10)}$$

where W_k and $\%NW_k$ are, respectively, the number of white students and the percentage nonwhite in district k. (For metro areas with only one district, this exposure rate would be equivalent to $E_m{}^*$). If there is more than one district in a metro area and if those districts have different racial compositions, this hypothetical exposure rate will be less than the overall nonwhite percentage in the area, $\%NW_m$:

$$\%NW_m \geq E_m{}^{**} \geq E_m{}^* \geq E_m \,.$$

These exposure rates can be used in decomposing the racial segregation that exists in any area of the state. Total segregation is measured by applying the gap-based segregation index, where actual exposure is compared to the racial composition of all public schools in a metro area:

$$S_m = (\%NW_m - E_m) \,/\, \%NW_m \,. \qquad \text{(B-11)}$$

This total measure can be decomposed into three components: the portion due to racial disparities at the classroom level, within schools:

$$S_m^W = (E_m^* - E_m) / \%NW_m ; \qquad \text{(B-12)}$$

the portion due to racial disparities at the school level, within districts:

$$S_m^B = (E_m^{**} - E_m^*) / \%NW_m ; \qquad \text{(B-13)}$$

and the portion due to racial disparities at the district level, within counties:

$$S_m^D = (\%NW_m - E_m^{**}) / \%NW_m . \qquad \text{(B-14)}$$

Total segregation can thus be expressed as the sum of these three components:

$$S_m = S_m^W + S_m^B + S_m^D . \qquad \text{(B-15)}$$

Note that S_m^B is the segregation index that most conventional studies of school segregation calculate, since those studies typically have data at the school level only. Also note that the between-district portion S_m^D will be zero if a metro area has only one district.

APPENDIX C

DEFINING CLASSROOM ASSIGNMENTS

As stated in the text, data were made available in the form of "student activity reports," which give the enrollment by race and grade level of each designated activity in every school. To provide more detail on the use of these data to define classroom groupings, we illustrate the methodology using data for several schools in the 2000/01 school year. Table A2 lists seventeen of the categories used in the state's data collection system for characterizing the activities of elementary school students, along with the number of students in each of six schools, at grades 1 or 4, assigned to these activities. The next to last line shows the total enrollment for the designated grade in each school.

Table A2. Students by Activity, Six Illustrative Elementary Schools, Grades 1 and 4, 2000/01.

		Durham		Forsyth		Hoke	
	Activity code	Elem. school A	Elem. school B	Elem. school C	Elem. school D	Elem. school E	Elem. school F
School Code		360	364	462	428	328	346
Grade		1	4	1	4	1	4
Subjects:							
Self-Contained	0000	178	140	101	83	95	132
Individual Curriculum	0001					10	8
Language Arts/Math	120	2			25		
L.A./Math/Science	123				1		
Reading	1001	43			88	84	125
Language Arts	1010		46				132
English as 2nd Lang.	1038	12	5				
Elem. School Spanish	1175			64	167		132
Math	2001		28				132
Computer Skills	2501	178	137		155		
Science	3001		149				132
Social Studies	4001						132
General Music	5001	178	135	83	82	87	132
Chorus I	5005				18		
Visual Arts	5030	178	135	64	82	87	132
Physical Education	9001	178	135	83	82	90	132
Health Education	9010						132
Membership count		175	140	104	81	100	135
Best fit activity		0000	0000	0000	5001	0000	0000

To see how these data are used to define classroom groupings, consider the data for the 1st grade in Elementary School A in the Durham school district, a school that had 175 1st graders according to

its fall membership report to the state. The activity report for the school showed a total of 178 1st graders enrolled in "self-contained" classes. As Table A3 shows, these 178 1st graders were distributed across nine different sections, some of which had only 1st graders, and others of which combined kindergarten and 1st grade students. In the case of this particular school, it so happened that this exact configuration of nine classes was repeated for each of four other activities (computer skills, general music, visual arts, and physical education), suggesting that whole classes took these courses together. The rule we followed for assigning students to classrooms was to choose the subject (or, in the case of 7th and 10th grades, the combination of subjects) whose total enrollment for the grade of interest came closest to that grade's total enrollment, taken from the school's membership report. In cases where several activity designations produced the closest count, such as in the case of Elementary School A, the self-contained category was used if it was one of them, although in practice it probably would have made no difference, given our impression that classes of students tend to go en masse to special classes. For the six illustrative grades shown in Table A2, the self-contained activity provided the best fit in all but one case. One feature of the data that is vividly illustrated by this table is the variety across schools and grades in what activities were reported, and in how much each was used. For example, English as a Second Language was employed as an activity in only two of the schools shown in the table, both in Durham. And the number of categories utilized also differed, even between schools in the same district: Elementary School E's 1st graders were engaged in six designated activities while Elementary School F's 4th graders had twelve.[61]

Once the classroom groupings for a grade in a school were determined through this process of matching, information on each classroom's racial composition could be used to produce an exposure rate as defined in the text, where W_i is the number of white students in classroom i and $\%NW_i$ is the racial composition of that classroom. Note that in these calculations students from all grades are counted, not just those in the grade of interest.

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61. For the 1st grade, the activity designations that produced the best fit were (followed in parentheses by the percentage of schools in which this occurred): self-contained (83.4%), general music (5.7%), visual arts (1.9%), physical education (1.7%), reading (1.3%), all others (6.0%). For the 4th grade, the designations yielding the best fit were: self-contained (73.1%), general music (5.1%), reading (3.6%), math (2.6%), language arts (2.2%), health/physical education (1.8%), elementary school Spanish (1.6%), visual arts (1.6%), science/physical education/health (1.4%), physical education (1.3%), all others (5.7%).

Table A3. Composition of Self-Contained Classrooms with 1st Graders, Elementary School A, Durham, 2000/01.

	1st Graders		Students in other grades		Total classroom
Section	White	Nonwhite	White	Nonwhite	% Nonwhite
1	5	9	4	7	.64.0
2	4	7	2	8	71.4
3	6	9	5	6	57.7
4	8	18			69.2
5	7	17			70.8
6	5	19			79.2
7	8	16			66.7
8	10	16			61.5
9	8	6	4	8	53.8

Source: North Carolina Dep't of Public Instruction, Unpublished Student Activity Report.

Because they feature many more separate courses than is typical in elementary schools, it is instructive to see how our methodology is applied to high schools. Recall that we focus on classroom assignments in English courses only. Even with this restriction, however, the task of assigning students is by no means simple, owing to differences across schools in the utilization of the available activity designations related to English. As illustrated by the seven high schools shown in Table A4, the basic English courses (I–IV) yielded counts of students that were in most cases not far different from the total reported in the membership report. In other cases, the total of these four courses did not come close. In an attempt to find classroom combinations that included 10th graders exactly once, we tried a variety of combinations, as shown. In the case that more than one combination tied for best fit, we used the "all" category if it was one of those categories. Otherwise, we arbitrarily chose the last tying combination, using the order shown on this table. Despite these attempts to reconcile the enrollment numbers from activity and membership reports, significant discrepancies remained in some schools. For example, the closest we could come in High School M to accounting for the 401 reported 10th graders was 201, using the "all" combination of English courses. Fortunately, we were able to come much closer in most schools.[62]

62. For the 7th grade, the combinations of courses yielding the best fit, using the numbers appearing in Table A4, were: all (41.9%), 1+3+5 (27.4%), 3 (8.3%), 1+2+5 (7.1%), 3+4+5 (4.7%), 1+2+3+5 (3.4%), 2+3+4+5 (3.1%), 2+4+5 (1.6%), 2 (1.1%), all others (1.5%). For the 10th grade, the combinations yielding the best fit were: all (82.8%), 1+2+3+5 (8.9%), 1 (5.1%), 1+3+4+5 (1.1%), all others (2.2%).

Table A4. Students by Activity, Seven Illustrative High Schools, 10th Grade, 2000/01.

		Durham			Forsyth			Hoke
	Subjects*	High school G	High school H	High school I	High school J	High school K	High school L	High school M
1	1021–1029	458	386	429	391	515	416	192
2	1001	0	0	0	0	0	0	0
3	1010	0	0	0	0	0	0	0
4	109–140	0	0	0	17	8	6	0
5	1038, 9210–9213	0	0	8	9	9	22	0
6	All	483	404	450	430	570	470	201
7	1+5	458	386	437	400	524	438	192
8	2+5	0	0	8	9	9	22	0
9	3+5	0	0	8	9	9	22	0
10	7+4	458	386	437	417	532	444	192
11	2+4+5	0	0	8	26	17	28	0
12	3+4+5	0	0	8	26	17	28	0
13	1+2+5	458	386	437	400	524	438	192
14	1+3+5	458	386	437	400	524	438	192
15	1+2+3+5	458	386	437	400	524	438	192
16	2+3+4+5	0	0	8	26	17	28	0
Membership		445	358	420	376	437	421	401
Best fit activity		15	15	1	1	1	1	6

* 1021–1024 English I, II, III, and IV, respectively; 1025–1029 Special Instruction English; 1001 Reading; 1010 Language Arts; 109–140 Combinations of Language Arts/Math/Science/Social Studies/ PE Health (always including Language Arts); 1038 English as a Second Language; and 9210–9213 Occupational English I, II, III, and IV, respectively.

Our decision to count all students in the identified classes, rather than just those students in one of the selected grades, makes a noticeable difference only for the 10th grade. For the state as a whole in 2000/01, the average exposure rate of whites to nonwhites using our approach was 0.33, 0.32, 0.29, and 0.30 in grades 1, 4, 7, and 10. Basing calculations only on students in those grades produces corresponding rates of 0.33, 0.31, 0.29, and 0.26. By basing our calculations on all students in classrooms with at least one 10th grader, we account for the classrooms' actual racial compositions and avoid the potentially misleading practice of recording only the racial composition of 10th graders in the class. In many cases, such small partial classes appear to be all-white, while in fact they are racially mixed when students from all grades are counted.